FACTORS AFFECTING SURGICAL OUTCOMES OF POST-LAPAROSCOPIC CHOLECYSTECTOMY BILE DUCT STRICTURES

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CERTIFICATE

This is to certify that the dissertation entitled **– "FACTORS AFFECTING SURGICAL OUTCOMES OF POST LAPAROSCOPIC CHOLECYSTECTOMY BILE DUCT STRICTURES"** is the bonafide original work of **Dr. J.SARAVANAN** in partial fulfillment of the requirements for .**M.Ch. Branch VI (Surgical Gastroenterology & Proctology)** examination of **THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY** to be held on August 2014. The period of study was from August 2009 to December 2013.

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DECLARATION

I Dr. J.SARAVANAN, solemnly declare that this dissertation entitled **– "FACTORS AFFECTING SURGICAL OUTCOMES OF POST LAPAROSCOPIC CHOLECYSTECTOMY BILE DUCT STRICTURE"** is the bonafide original work done by me at the Department of Surgical Gastroenterology and liver transplantation, , Stanley Medical College and Government Stanley Hospital during the period 2011-2014 under the guidance and supervision of the Professor and Head of Department of Cardiology of Stanley Medical College and Government Stanley Hospital, **Prof. Dr. G. MANOHARAN, M.S, M.Ch., FAIS., FICS.,** This dissertation is submitted to **THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY,** towards partial fulfillment of requirement for the award of **M.Ch. Degree (Branch - VI) in SURGIAL GASTROENTEROLOGY AND PROCTOLOGY**.

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INTRODUCTION

Cholecystectomy is one of the commonest abdominal operations. Bile duct injury is uncommon but have far-reaching consequences with increased morbidity and mortality.The profile of bile duct injury has changed since the introduction of laparoscopic cholecystectomy. Apart from increasing morbidity and mortality and decreasing the quality of life and survival of individual patients, it comes at an enormous cost to society. Bile duct injury is the most common cause for litigation in laparoscopic gastrointestinal surgery.It is not only the experience with the surgical procedure that accounts for the problem, but possible also inexperience with the management of the complications.

The problem seems to be more acute in developing nations such as India. While objective data may be lacking , the most tertiary care institutions are seeing a larger number of patients with bile duct injuries. In the open cholecystectomy era the incidence of bile duct injury was 0.1% to 0.2%. An increase in iatrogenic bile duct injury from 0.1% to 0.2% up to 0.4% to 0.7% paralleled the rise of laparoscopic cholecystectomy in recent times. [1] Laparoscopic cholecystectomy was introduced in the late 1980s and was adopted by several institutions

throughout the 1990s. Through the early 1990s it was thought that the high rate of this complications was because of a learning curve associated with laparoscopic procedures.However , this high rate has reached a plateau instead of declining , and subsequent publications have shown that a high rate of bile duct injury is an inherent problem of the laparoscopic procedure.

Various factors have been proposed for the different outcomes of these patients [2]. Among biliary surgeons, debates exist regarding the optimal timing of repair after LC-BDI. By and large it is accepted that if an injury is identified intraoperatively, then immediate repair by a hepatobiliary surgeon is the best approach [3-6]. A late repair is preferable by most of larger studies because an early repair has a higher risk of developing biliary stricture [7-8], whereas Schmidt et al prefer an early repair because it decreases hospital stay, pain, and inconvenience.[9]. When endoscopic techniques are not effective, different surgical reconstructions are performed. The goal of surgical treatment is to allow good bile flow to the alimentary tract. To be aware of the presence of postoperative benign biliary strictures and find a best approach for treatment,we have analyzed the outcome of surgical treatment of 41 patients by classified according to Bismuth

classification systems . The present study also evaluated clinicopatholgical factors influencing surgical outcomes following hepaticojejunostomy following laparoscopic cholecystectomy.

REVIEW OF LITERATURE

Gallstones are an extremely common condition, occurring in approximately 10% to 20% of the adult population.

Strasberg et al reported a 0.3% incidence of injuries in a literature review of open cholecystectomies .Laparoscopic cholecystectomy is considered the gold standard for the surgical treatment of gallstone disease, because it results in less postoperative pain, better cosmesis, shorter hospital stays, and less disability when compared with open cholecystectomy. Worldwide various studies documented a dramatic increase in bile duct injuries associated with the laparoscopic approach, ranging from 0.4% to 1.2%[10,11]. It has long been thought that the high rate of this complications was because of the so called - learning curve effect.

A large recent report showed that an initial decline in injuries was not sustained at the end of the study [12] . Hence, it is clear that the incidence of bile duct injury has stabilized above the historically accepted rate for open cholecystectomy. Laparoscopic cholecystectomy–associated bileductinjury(LC-BDI) continues to be a

clinical problem with significant morbidity for patients. These preventable injuries can be devastating, increasing the morbidity, mortality, and medical cost, while decreasing the patient's quality of life. Biliary injuries will always exist, and we need to be aware of the best methods to avoid, evaluate, and treat them.

INDIAN DATA

Although there are several published Indian studies with regard to referred patients with bile duct injury and strictures ,the incidence was not estimated. Only few Indian studies provide complete institutional data. The three large Indian studies reported bile duct injury incidence as with a range from 0.3% to 2.4%[.13,14,15]. These are hospital-based studies and there is no published data for bile duct injury in India. The seemingly high rates are possibly because of the referral bias i.e., more difficult cholecystectomy and the training component (relative surgical inexperience).

PATHOGENESIS

Risk factors:

Factors with an increased risk of bile duct injury can be characterized as anatomical factors, pathologic factors, technical factors.

ANATOMICAL FACTORS :

Anatomical factors refers to the anatomical anomalies that lead misidentification of biliary structures leading to inadvertent injuries .These include aberrant right sectoral bile duct union,cystic duct anomalies etc,.The classic laparoscopic biliary injury described by Davidoff et al involves misidentification of common bile duct as the the cystic duct, ligation and division of the distal common bile duct, misidentification of the cystic artery as a hepatic artery, injury and ligation of right hepatic artery, and finally ligation and transection of the proximal common hepatic duct.[16]. In 25% of the patients the right hepatic duct per se is absent. [17].

Cystic duct variations leading to Bile Dcut Injury :

- A very short cystic duct .
- An absent cystic duct (the sessile gall bladder).
- A long tortuous cystic duct coursing around the bile duct anterior or posterior to it and entering on its left side.
- Double cystic duct

Bile duct variations leading to BDI:

- Aberrant right sectoral ducts entering the common hepatic duct below the confluence
- Aberrant right sectoral ducts entering into the cystic duct or rarely into the GB
- Sub-vesical ducts

Vascular anomalies :

- It is common among 20% of the patients
- Very short cystic artery
- “Caterpillar hump”- a long tortuous right hepatic artery coursing in calot’s triangle.

Deziel et al,in a large mutli-institutional analysis of 77,604 laparoscopic cholecystectomies reported 12% case of hepatic artery injury in 365 patients with the major BDI.[18]. The reported prevalence of concomitant hepatic artery injury varies between 12% and 47% in patients with laparoscopic BDI.

PATHOLOGICAL FACTOR:

Pathlogical factors e.g. acute cholecystitis, mirizzi syndrome, xanthogranulomatous cholecystitis may make laparoscopic cholecystectomy difficult by increasing the difficult of handling the GB. Several studies documented that the laparoscopic approach is safe in selected cases of acute cholecystitis which was considered an absolute contraindication during the early era of laparoscopic cholecystectomy. [20].

Hence,the likelihood of the presence of one or more of these should forewarn the operator for extra precautions and low threshold for conversion

- Gangrenous gallbladder /empyema gall bladder – though acute cholecystitis is no longer considered a contraindication to LC , inflammation obscures the anatomy, the tissues are friable and persistent oozing from the inflamed and vascular tissue may obscure planes ,contributing to high rates of BDI

- Thick walled distended GB(Difficult to hold and manipulate)

- Tense distended GB (difficult to hold ,likely to get perforated with bile and stone spillage)

- Single large stone impacted at the neck
- Small contracted GB
- Intrahepatic GB
- Mirizzi's syndrome –it precludes a safe removal of the GB and necessitates a subtotal cholecystectomy .in presence of cholecystocholedochal fistula

  a Roux-en-Y-hepatico-jejunostomy may be required
- Presence of cholecysto-duodenal /cholecystocolonic fistulae
- Cirrhosis and portal hypertension- both open and laparoscopic cholecystectomy may pose special problems related to the presence of :
  - Coagulopathy causing increased bleeding
  - Collaterals in the anterior abdominal wall
  - Adhesions with neovascularity
  - Presence of stiff liver which makes its retraction difficult

- Inadequate visualization of calot's triangle due to thick collateralized tissues.

- Presence of extensive preicholecystic and pericholedochol collaterals

- A difficult GB bed because of collaterals

SURGICAL TECHNIQUE –RELATED RISK FACTORS

Cholecystectomy open or laparoscopic, strict adherence to the basic principles of cholecystectomy prevents bile duct injury. Isolation of cystic artery and cystic duct followed by division of cystic artery and cystic duct and dissection of the GB from its bed it imperative for safe cholecystectomy. At laparoscopy even minor bleeding may obscures the field. [21]..

- In Open Cholecystectomy, dissection begins with anterior dissection –opening of the triangle anteriorly. In Laparoscopic Cholecystectomy, the posterior dissection is started first (30 degree telescope is helpful)

- Retraction of the fundus of the GB torward cephalad direction prevent aligning of the cystic duct with the CBD and inadvertently injuring the [22]

- The most important safety precaution in LC is completing the dissection of calot's triangle till the critical view of safety shows the two tubular structures (cystic duct and cystic artery) cleanly dissected with only the liver seen though the gap [23]

- Excessive use of electrocautery in calot's triangle result in delayed ischemic stricture of the bile duct months and years after LC

- The technique of subtotal/partial cholecystectomy should be remembered and used whenever obscure calot's triangle is encounterd. All stones, however, should be removed. The remant GB wall can be sutured or stapled closed, as feasible

- The use of clips are related specifically after laparoscopic cholecystectomy , leading to bile leakage with greater frequency [24]. Clips are inherently less secure, which become more insecure if manipulated [25]. Reports of clip migration have also been reported [26-28].

- Inappropriate clipping of a thick,rigid or acutely inflamed cystic duct,scissoring of the clips, “clip on clip”, vigorous suctioning or dissection close to the clips, division of clipped structures with diathermy causes bile leak or bleeding. Blind or hurried clipping in an effort to control bleeding can lead to BDI.

COGINITIVE FACTORS

It is now belived that surgeon-cognitive factors plays important part in the causation of bile duct injury. This happens in LC because of absence of tactile input and limited visual input (2-dimensional and 3-dimensional)

- Heuristics are subconscious decision-making processes to enable us to make decisions .however these assumptions are not correct as with BDI [29]

- Stewart way classifications is based on the cognitive aspects of surgical errors [30]

ERROR TRAPS

Strasberg defined error traps [31]

The Infundibular view error trap- circumferential 360 degree dissection is not done to demostrate the CD leading to GB .

Fundus down dissection error trap-setsup BDI because the calot's triangle is obliterated in severe inflammation

Aberrant RD error traps – when the main or sectoral is mistaken for CD and the absence of filling of part of the duct is missed on IOC

Parallel cystic duct error traps- dissection of CBD rather than CD

ROLE OF INTRAOPERATIVE CHOLANGIOGRAM

Routine intraoperative cholangiography remains controversial. [32-34] . Ludwig and colleagues (2002) noted routine uses halved the number of ductal injuries in a cholangiogram group (0.21%) compared with a selective group (0.43%).[35].Fletcher and colleagues (1999) reported reduced the incidence of biliary injury twofold to eightfold in complicated cases [36-37].In Olsen (1997) review , found that interpretion was correctly done in only two of 32 cholangiographies .

However, as many argue, an IOC is neither a panacea for complete protection against BDI nor for complete protection against BDI. Visual cholangiography [38], Laparoscopic

ultrsonography, fluroscent choangiography [39]after i.v. injection of indocyanine green (ICG) are other techniques to improve the assessment of biliary anatomy during LC .

MISCELLANEOUS FACTORS

Higher rate of BDI following LC have been reported in males, patients of Asian descent and in obese patients [39]

CLASSIFICATIONS SYSTEMS

Many classification systems have attempted to sort BDI for planning management and prognostication . None of the systems is ideal in all respects .

BISMUTH CLASSIFICATION

The classifications of bismuth was used because of the ease of management and operative risk stratifications. It is often used to describe established bile duct injury.[40]

TABLE – 1 : BISMUTH CLASSIFICATION

Type	Anatomy
1	CHD: stump > 2 cm
2	CHD stricture : stump > 2 cm
3	Stricture without any residual common hepatic duct with intact confluence
4	Hepatic duct confluence destruction : both right and left hepatic ducts separated
5	Involvement of aberrant right sectoral hepatic duct alone or with CHD stricture

STRASBERRG CLASSIFICATION

Strasberg proposed a comprehensive system that incorporates bismuth's scheme and also on the basis of review of the literature on laparoscopic cholecystectomy. [41]

TABLE – 2 : STRASBERG CLASSIFICTION

TYPE	ANATOMY
Type A	Minor leaks from the cystic duct
Type B	Occlusion of a part of the biliary tree
Type C	Bile leakage from a duct not in communication with the common bile duct
Type D	Lateral injuries to the extrahepatic common bile duct
Type E	Circumferential injury to the extrahepatic bile duct ;
Type E-1	CHD Stump > 2 cm
Type E-2	CHD Stump < 2 Cms
Type E-3	No CHD Stump
Type E-4	Confluence involved with separation of right and left systems
Type E-5	Injury to an aberrant right segmental duct with or without injury to the CHD/CBD

CSENDES CLASSIFICATION [42]

TABLE – 3 : CSENDES CLASSIFICATION

TYPE	ANATOMY
Type I	Small duct, RHD, CHD
Type II	Cystic – CBD Junction
Type III	Partial or complete section of CBD
Type IV	Resection

AMSTERADAM CLASSIFICATION [43]

TABLE – 4 : AMSTERDAM CLASSIFICATION OF BILE DUCT INJURIES

TYPE	ANATOMY
Type A	cystic duct leak or peripheral hepatic radicals leak
Type B	Major hepatic duct injury with common hepatic duct leak or aberrant segmental extrahepatic branch of right hepatic duct leak
Type C	Common hepatic duct stricture without leakage.
Type D	Complete transection of common hepatic duct.

STEWART-WAY CLASSIFICATION [44]

Stewart-way has proposed to explain the anatomy and mechanism of bile duct injury

TABLE – 5 : STEWART AND WAY CLASSIFICATION OF LAPAROSCOPIC BILE DUCT INURY

Class	Anatomy
Class I	Injuries occur when the common bile duct (CBD) is mistaken for the cystic duct, but the error is recognized before the CBD is divided.
Class II	Injuries involve damage to the common hepatic duct from clips or cautery used too close to the duct. visibility is limited due to inflammation or bleeding.
Class III	Injuries, the most common, occur when the CBD is mistaken for the cystic duct. transected and a excised (removed).
Class IV	Injuries involve damage to the right hepatic duct (RHD), either because this structure is mistaken for the cystic duct, or is injured during dissection.

KAPOOR BCD CLASSIFICATION [45]

A new bile leak, circumference involved and duct injured (BCD) Classification was proposed by VK Kapoor and is summarized below

TABLE – 6 : CLASSIFICATION OF BILE LEAK, CIRCUMFERENCE INVOLVED AND DUCT INJURED FOR BILE DUCT INJURY

Class	Description	Types	Diagnosed by
B	Bile leak	By- Yes (Open Duct) Bn–No (ligated / clipped duct)	Bile in drain/ on aspiration, isotope scan, cholagniography (ERC, MRC)
C	Circumstances involved	Cf-full circumstances (transaction or excision)	Isotope scane, cholangiography (ERC, MRC), operative findings.
D	Duct injured	DS-significant duct (CBD, CHD, RHD, right sectoral or segmental duct) Di-insignificant duct (cystic duct, sub-segmental duct, sub-versical duct)	Cholangiography (ERC, MRC, operative findings.

INVESTIGATIONS

Liver function test

It has been shown in small studies that liver enzymes are often deranged after LC because of pneumoperitoneum and raised intra-abdominal pressure. Biekel et al showed that only 41(3.9%) of 1034 patients had deranged LFT, in whom it was because of choledocholithiasis. Hence any derangement of LFT after LC should be carefully followed up with a high index of suspicion for choledocholithasis or a bile duct injury.

Ultrasound

Ultrasound is the best first-line imaging for intra-abdominal fluid collecctions . It is also important to image a potential biloma with ultrasound because , it is also used to target the bilioma for percutaneous drainage (PCD) .

Pitfalls : It is observer –dependent investigation and may miss small bilomas and abscesses.

Nuclear scan:

HIDA is valuable in assessing incomplete strictures, and isolated sectoral hepatic duct strictures [45].Although the anatomical delineation is not very clear, it quite accurate in demonstrating bile leaks. Newer agents mebrofenin is excreated even with very high serum bilirubin unlike HIDA, DISIDA which not excreated in jaundiced patients .

Pitfalls :

A block in the lower bile duct caused by a stone may be interpreted as a complete transection .A high output biliary fistula may lead to the tracer draining out mainly throught the fistula with very little gut activity, even if there is biliary continuity.

COMPUTED TOMOGRAPHY:

CT is the best initial study which helps to localize the level of dutal obstruction also identifies fluid collections or ascites, vascular damage, and lobar atrophy.

Cholangiography

Delineation of the proximal biliary tree in the form of complete cholanigogram is extremely important for the successful repair of a stricture. PTC (percutaneous transhepatic cholangiography) provides information in selecting patients with for appropriate reconstructions. After the advent of MRCP, its role has lessened, but it still remains an important tool in refractory cholangitis .It allows serial ballon dilations and upsizing of stents that can start from 8F upto 22F.

ERCP

ERCP is occasionally valuable in the precise diagnosis of complete proximal bile duct and is appropriate for patients with suspicion of papillary stenosis . ERCP also plays a role in partial or lateral injury to the common duct [46]. Thus the role of ERC as a cholangiogram is limited only to low and incomplete biliary strictures.

MRC

Magnetic resonance cholangiography is the investigation of choice in patient with biliary strictures. Magnetic resonance cholangiopancreatography is a useful tool in bile duct injuries [47]. It shows the exact anatomy of the stricture, the entire biliary system and

specifically helps in delineating first and second order bile duct strictures which a standard PTBD gram may not be able to demonstrate unless multiple punctures are made. Associated hepatolithasis may be better shown by MRCP. [48-50]. The interpretation of the images in the MRCP may be hampered by the presence of biloma. Also collapsed bile ducts in presence of an on going external biliary fistula. [51]. Computed tomographicangiorgraphy (CTA) is often quick was to assess for a suspected biloma, hepatic abscess, and the condition of the hepatic vessels. If a pseudoaneurysm is observed , it should be tackled by conventional angiography and angioembolization before the biliary stricture is repaired.

PREOPERATIVE PREPARATION:

Operative repair of bile duct injuries needs more careful precise assessment for bile duct injuries which are recognized at the time of initial cholecystectomy. Cholangitis is a frequent occurrence in patients with bile duct strictures which is treated with appropriate antibiotics according to bile culture sensitivity report . Anemia should be corrected ; coagulation defects, with prolongation of the prothrombin time. treated with vitamin K or fresh frozen plasma. Malnurished patients are feed with enteral feedings through nasogastric or nasojejunal catheter

.Parenteral nutrition may be needed who are intolerant to enteral feeding .The preoperative management of complications must be addressed before biliary reconstruction can be considered. If cholangitis occurs without any response to antibiotics needs immediate biliary drainage .

MANAGEMENT :

Operative repair is considered to be the gold standard management of post laparoscopic bile duct stricture .The aim of the definite management of patients is to establish an uninterrupted bile flow into the gastrointestinal tract. Experience from large volume centers has consistently shown successful results following bilio-enteric drainage in more than 90% patients[52]

Surgical management :

The results of surgical repair depend on the timing of the repair, a history of previous failed attempts, the level of injury, associated vascular injuries, and the presence of infection at that time of the repair. However , the most important initial step for success of a bile duct stricture repair is the expertise and experience of the team performing it . Hence it is strongly advocated that repair should be performed in

established hepato-biliary centers by experienced hepatobiliary surgeons; as the first attempt at repair is the best chance for cure.

TIMING OF SURGERY:

Optimal timing for repair requires careful evaluation and depends highly on the patient's clinical condition, time from injury , hepatic function, type of injury (biliary fistula vs. obstruction), comorbidities, extent of inflammation, nutritional status, and presence of infection or abscess. Patients present at a median of 3 days after laparoscopic cholecystectomy (1 day to 93 weeks).[53] .

EARLY APPROACH :

Patients who present early after surgery, and show no signs of sepsis, intraabdominal collections, or vascular injury, should be considered for early repair within 72 hours. These patients tend to have simpler injuries.Strasberg type A injuries, cystic duct leaks, leaks from a duct of Luschka can be managed with endoscopic sphincterotomy and the placement of a biliary stents (typically 8- to 10-French. plastic stent). Strasberg type D injuries can also be approached in the early postoperative period. These injuries are also amenable to endoscopic

sphincterotomy and stenting.Immediate repair can performed if expertise is available.

In case of a partial transection of the common bile duct recognized at the time of initial surgery, primary repair over a T-tube gives good outcome. Fine, monofilament, absorbable sutures should be used for the repair and the T-tube brought out via common bile duct at a distant site away from the repair site . One study reported a restricture rate of nearly 100% for end-to-end repairs of the common bile duct especially if the injury is secondary to the use of cautery or results in complete transection of the duct .[14] These patients are best managed with a biliary-enteric anastomosis as later described. However, Stewart and Way indicate success of repair does not depend on timing of repair but rather depends on eradication of bilioma, , use of a single layer end-to-side hepaticojejunostomy with fine absorbable suture, and severity of Stewart-Way injury class.[54]

DELAYED MANAGEMENT OF BILIARY STRICTURE :

Walsh et al indicate that early stricture repair has a higher stricture rate than delayed repair (19% vs. 8%).[55]. Sahajpal et al report a high stricture rate in patients repaired between 72 hours and 6 weeks

of the injury.[56] . Waiting for atleast 6-8 weeks after the bile duct injury, may allow sepsis to be better controlled, and to allow patient recovery from the acute injury with better understanding of the level and type of injury.

If operative repair cannot be completed within 72 hours of injury because of patient condition or inability to complete radiographic workup, delay of repair is often advocated.[57] Others argue that this approach results in dense adhesions, making definitive repair more difficult.[58] .Regardless of timing of repair, intra-abdominal sepsis and patient condition must be stabilized before repair of complex injuries.

Some of the biliary injuries will not require biliary-enteric anastomosis. Because 31% to 54% can be successfully managed with closure over a T-tube or endoscopically stented, endoscopic or percutaneous management of the injuries should be considered in Strasberg type A and type D e duct injuries. But for major bile duct injuries, 93% will require surgical reconstruction with biliary-enteric anastomosis.

TECHNICAL APPROACHES TO BILIARY REPAIR:

END-TO-END BILE DUCT REPAIR.

The earliest techniques used for reconstruction was excision of the stricture with end-to-end anastomosis [60-62]. For a transected bile duct, primary suture repair or end-to-end primary repair is not advisable. Thus , patients who underwent end to end anastomosis had high failure . [63].Thus end-to-end repair has limited role in benign biliary strictures management.

BILIO-ENTERIC REPAIR.

Reconstruction and repair methods include also biliary bypass with Roux-en-Y hepaticojejunostomy or rarely hepaticoduodenostomy, closure over T-tube, removal of the obstructing clip, and endoscopic or percutaneous transhepatic dilation and stenting..

Successful bile duct enteric reconstruction is dependent on several factors:

1. Adequate preoperative assessment of biliary anatomy
2. Exposure of proximal, healthy bile ducts with adequate blood supply
3. The repair must include all injured/strictured ducts to ensure adequate drainage of the entire liver, and control of bile leakage.

4. Use of a healthy segment of intestine that can be brought to the anastomosis without tension (most often a Roux-en-Y jejunal limb)

5. Tension-free biliary mucosa-to-bowel mucosa anastomosis

TECHNIQUE:

Incision and Exposure

A right subcostal incision with or without an midline extension provides adequate exposure .Use of self retaining retractors like Thompson gives good exposure . Dissection should begin in the subhepatic area, and the hepatic flexure of the colon mobilized completely. A choledochoduodenal or duodenal wall rent occurring requires repair.

Sub hepatic adhesions are always encountered and these have to be taken down from the liver surface to mobilize and retract the liver and also to prevent loculated collections postoperatively. The dissection has to be meticulous to prevent injury to the adherent colon and to reach the hepatic hilum.

Since the distal duct generally cannot be used for anastomosis attempts to identify the distal bile duct are unnecessary; and such attempts risks injury to the hepatic artery and portal vein as it is usually encased in dense scar tissue.

APPROACH TO THE LEFT HEPATIC DUCT :

It is safe to divide the fibrous tissue between the bile duct and the liver (hilarplate) to expose the bifurcation of the hepatic duct as well as the extrahepatic left hepatic duct. This dissection is greatly facilitated by placing a curved retractor to elevate segment IVb in an anterocephaladdirection.This region is likely to be free of adhesions from previous surgery.

APPROACH TO THE RIGHT HEPATIC DUCT:

By effectively lowering the hilar plate,a plane of dissection is developed at the porta hepatis. The confluence may be exposed using above approach . If the extrahepatic course of the right hepatic duct is too short to be visualized , hepatotomies may be made to expose the right portal pedicle.

It is important to correlate the pre-operative cholangiogram with the intra-operative findings as this is an important factor affecting a successful outcome.

ANASTOMOTIC TECHNIQUE

A standardized technique of hepaticojejunostomy is applied .This technique is of particular utility for high anastomoses, where duct mobility and size are limited.

A 60-cm Roux-en-Y limb of jejunum is prepared about 20 cm from duodenal flexure . A generous length (15 to 20mm) of healthy bile duct is need for anastomosis keeping in mind the inevitable postoperative contracture.

If the right anterior and posterior sectoral ducts are isolated , a septoplasty can be done to join them to make a common stoma.

Two or more stomas may, however, be required in a high stricture. Anastomotic construction begins with an anterior row of 3-0 or 4-0 absorbable sutures, working from left to right. It is important not to injure any of the hepatic arteries as the blood of the bile duct might have been compromised by a non- apparent arterial injury during the index cholecystectomy.

A bilio-enteric anastomosis is established by a side-to-side or end to side Roux-en-Y hepaticojejunostomy by the blumgart-kelly technique[65].The hepp–couinaud approach incorporates the extrahepatic transverse portion of the left hepatic duct into the RYHJ. [66]. It is important to perform a high bilio-enteric anastomosis irrespective of the level of the stricture. Choledochoduodenostomy although easier to perform and technically feasible in low strictures may result in re-stricture as well as recurrent cholangitis.

Complicated procedures such as an intrahepatic cholangiojejunostomy(to the segment III or V ducts, Longmire procdure (hepaticojejunostomy to the cut surface of the liver), smith's mucosal graft, porto-enterosotmy , etc may be thought of as alternatives in high and difficult strictures but not recommended as they are all associated with ha higher risk of anastomotic stricuture and recurrence. A liver resection is best alternative in such cases.

Anastomosis is performed in a single layer using fine (3-0 or 4-0) long acting absorbable suture e.g., polyglactin or polydioxanone on a small,round- bodied needle.

USE OF STENTS:

The routine use of transanastomotic stents in all cases is not recommended. In case the anastomosis looks precarious (thin walled friable ducts, sutures cutting through) and an anastomotic leak is anticipated, a transcutaneous biliary drain can be placed retrogradely through the bile duct and into the liver parenchyma using a probe wire, a vascularized flap of omentum can also be used to protect the anastomosis. Transanastomotic stents are retained for several months and may sometimes be required for 6-12 months.

A liver biopsy (wedge or needle) is obtained in all patients to rule out a hepatic parenchymal cause of continued hyperbilirubinemia postoperatively. A sub-hepatic drain is usually left in situ.

HEPATIC RESECTION.

Patients who have concomitant vascular injury or undergone prior unsuccessful repairs or long-standing cholangitis often develop sectional duct strictures or interruptions between the right-sided and left-sided biliary tree, effectively precluding biliary-enteric revision. These patients land up in hemi atrophic liver .Such patients requires formal liver resection for removal of atrophied liver . Hepatic resection is usually indicated in refractory bilary stricture.

LIVER TRANSPLANTATION.

Transplantation is occasionally indicated for vascular injury leading to biliary cirrhosis [68-69]. .Orthotopic liver transplantation also considered in patients with secondary biliary fibrosis resulting from longstanding biliary obstruction progressing to cirrhosis .

PORTAL HYPERTENSION :

Reported incidence of portal hypertension at the time of referral is 10% to 20% of patients [70-71]. Bleeding esophageal varices, hypersplenism or ascites, render the overall prognosis far worse [72-73]. Collateral venous channels and dense adhesions make dissection difficult . It is preferable to attempt stenting or balloon dilation in seriously ill patients with jaundice and portal hypertension than to proceed to immediate definitive repair [74-78]; A portosystemic shunt is performed and the hepatic hilum is approached again after an interval of 3-6 months .in patients with portal hypertension creation of roux loop of jejunum amy be associated with blood loss: a simple loop with a distal jejuno-jejnostomy (Braun) may be used.

Surgical results:

The reported mortality following surgical repair of biliary stricture ranges from 0.6 to 1.7 %.[79-80] . Post operative complications are common after stricture repair (20- 40%)cholangitis, intra-abdominal abscess, and bile leaks are the common specific complications. Postoperative stricture formation can occur in the early or late postoperative period. With long-term followup, recurrent stricture rates of 10% to 14% have been reported.[81].80 % of recurrent strictures occur within 5 years of repair. [82].

Bile duct injuries and strictures are complex problems requiring a multidisciplinary approach involving surgeons, radiologists, and gastroenterologists. Failure to properly diagnose and/or manage these problems can result in chronic liver disease and/or chronic disabilities. Complete and accurate preoperative imaging is essential to successful outcomes. Appropriate surgical management with careful attention to detail and technique is also imperative. Excellent outcomes can be achieved by following these principles.

TABLE – 7 :TYPE OF INJURY AND TECHNICAL OF REPAIR

Type (Starsberg) of Injury	Technique of repair
TYPE A	Do not require reconstruction
TYPE B	Usually not discovered intraoperatively
TYPE C	Roux-en-Y hapatico-jejunostomy Ligation / clipping of duct (if small < 3 mm), delayed repair may be required in future
TYPE D	Simple suture closure Suture closure over a simple Stent / T-tube
E1, E2	End-to-end repair over a T-tube/internal stent Roux-en-Y hepatico-jeunostomy
E3, E4, E5	Roux-en- Y Hepatico-jeunostomy Need for two stomas in some E4 and E5

AIMS AND OBJECTIVES

This study was undertaken with the following aims and objectives :

1.To evaluate the clinico-patholgical factors- influencing surgical outcomes following biliojejunostomy for bile duct injury following cholecystectomy

2. To evaluate the factors affecting the perioperative outcomes following hepatojejunostomy for various types of post laparoscopic cholecystectomy bile duct injury

MATERIALS AND METHODS

Between august 2009 and December 2013 , 42 consecutive patient underwent bilioenteric anastomosis for post laparoscopic bile duct stricture in the Institute of Surgical Gastroenterology and Liver Transplantation at Government Stanley Medical College and Hospital. Of these one died of myocardial infarction in the immediate post operativeperiod . 41 consecutive patients were included in the study.

INCLUSION CRITERIA:

All Cases of post laparoscopic cholecystectomy bile duct strictures presenting to the Institute of Surgical Gastroenterology & Liver Transplantation for treatment were included in this study

EXCLUSION CRITERIA:

Patients with stricture due to choledochal cyst ,lithiasis, sclerosing cholangitis, , chronic pancreatitis or ampullary disease were excluded

The study was performed after getting the approval of Institute Ethical Committee of Government Stanley Medical college and Hospital. The written informed consent was obtained from each participants in the study.

PREOPERATIVE WORKUP:

All patients were evaluated with a baseline medical history and physical examinations and serum laboratory tests. Demorgraphic profile , clinical symptoms and signs with duration like abdominal pain, jaundice, pruritius, features of cholangitis , presence of calculi, bilioma drained, biliary fistula ,laparoscopic cholecystectomy or laparoscopic to open converted,no biliary surgery before this admission, interval between trauma and referral were elicitated and noted . Blood investigations complete haemorgam, renal function test with electrolytes, blood sugar, albumin, total bilirubin, AST,ALT, GGT, SAP were prospectively collected and entered.

Preoperative imaging- chest x-ray, abdominal ultrasonography, CECT, MRI+ MRCP ,type of stricture, degree of dilatation , operative details - no of biliary surgeries - , salvage procedures- like drainage of bilioma

drainage , post –op complications-cholangitis, stenosis, secondary biliary cirrhosis,duration of hospital stay were collected and entered.

The degree of bile duct dilatation

The degree of common bile duct dilatation was classified as follows: A, width above the stricture is less than 1.5 cm; B, width is from 1.5 to 3.0 cm; and C, width is more than 3.0 cm.

The level of biliary stricture

The level of biliary obstruction wasclassified according to Bismuth classification

OPERATIVE TECHNIQUES:

A standardized technique for bilioenteric was applied for biliary drainage. Reconstruction and repair methods include biliary bypass with Roux-en-Y hepaticojejunostomy with removal of the obstructing clip if present.

TECHNIQUE:

Incision and Exposure:

A right subcostal incision with or without an upper midline extension was made for adequate exposure . Use of self retaining retractors like Thompson gives good exposure of the relevant hilar anatomy. Dissection usually began in the right subhepatic area, and the hepatic flexure of the colon was completely mobilized. . A choledochoduodenal fistula or a duodenal wall tear during the dissection was repaired.

The dissection was meticulous to prevent injury to the adherent colon and to reach the hepatic hilum.

Proximal bile duct stricture was identified. The procedures consisted of Roux-en-Y biliojejunostomy, by modified Hepp-Couinaud technique . This technique begins with exposure of the left hepatic duct found .which is traced toward the right hepatic duct. Once the right hepatic duct is exposed, a

hepaticojejunostomy can be constructed by Blumgart- Kelly technique. No transanastomotic stents were used.

POST OPERATIVE CARE:

All patients received the same postoperative care by the same team of surgeons, Patients were monitored in the intensive care unit during the early postoperative course, with attention to fluid balace, oxygenation and tissue perforation. Antibiotics given according to the bile culture sensitivity. Early oral liquid was started between 2 to 4 days. Clinical symptoms, bile leak, wound infection, cholangitis were noted. LFT was done in the early post-operative period between 3^{rd} to 5^{th} POD. All post - operative complications were recorded.

PATIENT FOLLOW-UP

Patients were seen in the outpatient clinics within 3 months of initial operation and every other 3 months thereafter. The presence of symptoms, weight loss or gain, and food intolerance were noted and

patients were clinically examined, and liver function tests and ultrasound study were evaluated for each follow-up visit.

The follow up period of this study ended in December 2013 , so that every patient had at least 2 months of observation after operation.

The protocols , as described above, were approved by the institutional ethical committee.

STATISTICAL ANALYSIS

Data were analysed with SPSS software version 16.0 for windows. All continuous data were expressed as mean _ SD and were analysed by unpaired t test. Categorical data were expressed as number (percentage) and were analysed by Fishers exact test. P value of <0.05 was considered as statistically significant. Multivariate analysis was done to evaluate odds ratio with confidence interval.

RESULTS

This study was a prospectively collected data with retrospective analysis conducted in the Institute of of Surgical gastroenterology and liver transplantation , Stanley medical college and hospital, Chennai from August 2009 to December 2013. During the study period , a total of 42 consecutive patients who underwent hepaticojejunostromy for post laparoscopic biliary duct strictures were included. One patient was excluded as the patient died due to myocardial infarction .

Table VIII shows the clinical characteristics of these 41 patients. The mean age of presentation was with range of 19 to 67 years. Age distribution of 41 patients is shown in fig.1. Majority of the patients were in fourth and fifth decades

Gender distribution of fourty one patients is shown in fig 2. Overall , males comprised 15(36%) and females 26(64%). All the biliary lesion were referred from other hospitals. Upper abdominal pain was present in12(29%) patients. 18(43%) patients presented with cholangitis and jaundice in 36(86%) but only 14 (34%)of them had pruitius. Among the 41 patients,bilioma drained in18(43%) patients with 12 (29%) patient drained by imaged guided percutaneous method ,

6 (14%) by laparoscopic method. Bile duct calculi was present in 5(11%) patients and biliary fistula in 9 patients .

Total bilirubin and ALT were elevated in these patients and they were 6.88 (mg) and 92 IU respectively. 32 patients had laparoscopic surgery and rest had laparoscopic converted open surgery.

Radiological examinations (Ultrasonography, CT, MRCP) showed dilated intrahepatic bileduct, discontinated extrahepatic bile duct and invisible common bile duct. They were helpful to reveal obstructive plane at different levels of biliary duct system.

In our study, 6 (14%) patients were reported as Bismuth type I, 13 (30%) as Bismuth type II, 14 (34%)as Bismuth type III, 8(19%) as Bismuth type IV, and 0 as Bismuth type V. Table IX/ Fig: 3. 27 patients had dilatation of bile duct above stricture were less than 1.5 cm in, 13 patients had dilatation from 1.5 to 3.0 cm in, and 1patients had dilatation more than 3.0 cm in .Table X/ Fig :4

All patients underwent bilioenteric anastomosis.In bilioenteric anastomosis patients, restoration of biliary enteric continuity was achieved with a Roux-en-Y jejunal loop by means of either intrahepatic cholangiojejunostomy, hepaticojejunostomy. Bismuth IV strictures were managed by separately anastomosing the right and left hepatic ducts to a Roux-en-Y limb, which was considered as intrahepatic cholangiojejunostomy.Anastomosis was done with single layer of interrupted 3-0 to 4-0 vicryl stitches to obtain a mucosa-to-mucosa approximation. No anastomotic stents were used.

The median hospital stay [Table XI] after final surgical intervention was 21, range: 8–39days in this institution. The 30-day operativemortality rate was 0. Complications [Table XII] occurred in 11 (23.4 %) patients. Reoperation was not required in any patient required because of intestinal obstruction in the early postoperative course. There was no intraoperative mortality. Hospital mortality was observed in [0.02%] patients.

Mean follow-up was 38 months , range: 11.6–67months. 32 patients had excellent or good results , whereas the remaining 9 patients experienced fair or poor results. 2 patients with recurrent cholangitis without evidence of stricture at the anastomsosi had a favorable

outcome with simple medical treatment. 1 patient underwent biliary enteric reanastomosis with recurrent cholangitis with anastomotic stricture . 2 patients with calculous in bile duct were extracted by endoscopic method. Restrictures requiring further treatment occurred in 3 patients within 2 years and two patient had ballon dilatation and one patient had biliary enteric re-anastomosiswas successfully performed .

Comparison of patient clinical databetween early and delayed surgery group for benignbiliary strictures

In order to find the factors related perioperative outcome, we compared the differences of clinical data between group undergoing early surgery (<6 wks) and delayed group (> 6 wks) Table XV .By conventional criteria the association between the interval between trauma and surgery groups , dilatation of bile ducts is considered to be statistically significant since p <**0.0226**. Patients who underwent surgery Interval between trauma and surgery (≤ 6 weeks) group had less incidence of dilatation of bile ducts compared to in Interval between trauma and surgery (> 6 weeks) group .

The degree of bile duct dilatation is statistically significant factor afftecting surgical outcomes . Patients with bigger (> 1.5 cm) bile duct

dilatation had better outcomes than those with smaller one. Similary ,there was a statistically significant relationship between interval between trauma and surgery groups and bilioma since p value is<**0.026*.** Patients who underwent surgery Interval between trauma and surgery (≤ 6 weeks) group had less incidence of dilatation of bile ducts compared to in Interval between trauma and surgery (> 6 weeks) group .By conventional criteria the association between the Interval between trauma and surgery groups and bismuth classification is considered to be statistically significant since $p < 0.05$. Patients who underwent surgery interval between trauma and surgery (≤ 6 weeks) group had less incidence of early bismuth types compared to in Interval between trauma and surgery (> 6 weeks) group . Hence patients with delayed surgery had better outcome than patients with early surgery.Under laboratory findings [Table XVII] the total bilirubin levels are (5.88±3.41) in interval between trauma and surgery (≤ 6 weeks) group compared to interval between trauma and surgery (> 6 weeks) group (4.8±4.37). By conventional criteria the association between the Interval between trauma and surgery groups and total bilirubins levels is considered to be statistically significant since $p < 0.05$. Patients who underwent early surgery, the total bilirubin levels are high in interval between trauma and surgery (≤ 6 weeks) group compared to interval

between trauma and surgery (> 6 weeks) group. This proves that there is a significantly higher expression of high level of total bilirubin levels in interval between trauma and surgery (≤ 6 weeks) group compared to interval between trauma and surgery (> 6 weeks) group .Hence delayed group had lesser level of bilirubin with good outcomes.

Similarly the serum albumin levels are (2.24±1.09) in interval between trauma and surgery (≤ 6 weeks) group compared to interval between trauma and surgery (> 6 weeks) group (3.25±0.47). By conventional criteria the association between the interval between trauma and surgery groups and serum albumin levels is considered to be statistically significant since p <0.044. This proves that there is a significantly higher expression of serum albumin levels in interval between trauma and surgery (> 6 weeks) group compared to interval between trauma and surgery (< 6 weeks) group .

Factors such as hospital stay after final surgical intervention and ,number of biliary surgery,cholangitis,presence of calculous, types of initial surgery were not significantly related to better surgical outcomes . Detailed univariate results were listed inTable XIII .Multivariable logistic analysis revealed that dilatationof bile duct (< 1.5 cm) and

Bismuth classification(Type I) were the independent variables related to outcomes of hepaticojejunostomy.[Table XIV]

DISCUSSION

The goal of treatment for a bile duct stricture is long-term absence of symptoms and free from further hospitalization. The surgical therapy is to establish a bile flow within the gastrointestinal tract ina manner that prevents restricture.The most important surgical principle is to suture healthy tissues with a tension-free anastomosis. [83-86]. Excision of the stricture and end-to-end anastomosis establish the repair with a normal anatomic drainage through an intact sphincter of Oddi. But end-to-end bile duct anastomosis can done in only selected patient because of invariable loss of duct length . Also cautery injuries will have a larger field of ischemic injury than initially recognized, and primary closure may lead to late stricture formation especially with completely transected bile duct . Larger studies by Csendes et al and Stewart & Way et al has reported a 50% to 60% incidence of long-term failure with end-to-end repair [87-89]. Previous reports have suggested hepaticojejunostomy as the best treatment for benign biliary stenosis[90] .

In this study, our surgical procedures consisted of Roux-en-Y hepaticojejunostomy, a modified Hepp-Couinaud technique as described.[91] . This technique begins with exposure of the left hepatic duct found which is traced toward the right hepatic duct. Once the right hepatic duct is exposed, a side-to-side or end-to-side right hepaticojejunostomy can be constructed. Our analysis was focused on patients with perioperative outcomes .Univariate analysis showed the degree of dilatation > 1.5 cm, type I bismuth classification, bilioma drained, total bilirubin, albumin as factors statistically correlated to perioperative good outcomes.[Table XIII]. In our series, the degree of common bile duct dilatation was one of the significant factor found to affect the outcome. Dilatation provides a wide anastomosis, resulting in easy and effectual long term stenting of the biliary tree. As in our studies, Tocchi and colleagues (1996) observed that , independent of stricture location ,the best results correlated directly with the degree of biliary ductal dilation.Larger studies by chapman has identified other factors associated with poor outcomes including albumin , total bilirubin, bismuth type 3 or higher types . Schmidt and colleagues (2005) confirmed this study result that a repair in the presence of infection and injury located at or above the bifurcation were independent predictors of the development of major biliary

complications. In the multivariate analysis, the degree of bile duct dilatation(>1.5 cm),delayed surgery after 6 weeks proved to be significant independent predictors of outcome. Multivariate analysis demonstrated that after adjusting for age, gender, level of dilatation of the bile duct above the stricture in, patients in Interval between trauma and surgery (> 6 weeks) group 40% less chance developing complications than those in Interval between trauma and surgery (> 6 weeks) group .

Similarly after adjusting for age, gender, interval between trauma and surgery groups, patients with dilatation of the bile duct above stricture less than 1.5cm are 10 times more likely to suffer a complication than those with dilatation of the bile duct above stricture more than 1.5cm.The surgical outcome in our series was as good as that of other reports in the larger studies Table XX . According to most authors, the early postoperative morbidity rate is 20%-30% and mortality rate 0%-2%[92-94].

The most frequent early complication is wound infection 8%-17.7% [95,96] which is similar to the this study 22%. Mortality in our study is nil ..Other larger series results are shown in table XX.

Thus our results revealed complete and accurate preoperative imaging and assessment risk factors is essential to successful outcomes.

Early recognition and delayed repair after > 6 weeks with involvement of a multidisciplinary team specialized in biliary disease can result in successful repair of the biliary injury. Definitive repair requires biliary-enteric anastomosis.

LIMITATIONS OF THE STUDY

1.Small sample size

2. Short duration of the study

Due to the above limitations, we are not able to assess long term outcomes. Inspite of above shortcomings, our study forms an important base for future prospective long term studies.

CONCLUSION

Bile duct injury and stricuture formation following cholecystectomy can lead to significant morbidity, mortality and financial burden, and a diminution in quality of life .Failure to recognize and correctly manage can lead to lengthy and expensive litigation. Factors arrived after univariate analysis like bismuth type of biliary stricture , bile duct dilatation, bilioma drained, bilirubin, albumin especially multivariate analytic factors like type of biliary stricture and bile duct dilatation are assessed critically for excellent results . Hence , careful preoperative assessment of above risk factors , good preoperative preparation ,adherence to basic tenets of surgical prinicples helps to achieve good surgical outcome.

TABLE VIII

CLINICAL CHARACTERISTICS

Variables	Number of Patients
Patient Characteristics	
Age, mean, SD	41.29, 11.17
Sex, F/M	26/15
Symptoms and signs, n (%)	
Pain	12(6.83%)
Jaundice	36(19.15%)
Cholangitis	18(9.57%)
Pruritis	14(7.45%)
Calculus	5(2.66%0
Biliary fistula	9(4.79%)
Bilioma Drained	94(50%0
Biliary operation history before this admissionn (%)	
<2 times	38(92.68%)
≥2 times	3(7.32%)
Type of Surgeryn (%)	
Laparoscopy	32(78.05%)
Laparoscopy converted to Laparotomy	9(21.95%)
laboratory findings, Mean, SD	
TBR	5.34±3.89
AST	79.26±70.63
ALT	67.72±76.42
ASP	667.64±605.98
ALB	3.30±0.63

TABLE IX

BISMUTH CLASSIFICATION

Bismuth Classification n (%)	
I	6 (14.20%)
II	13 (32.27%)
III	14(34.37%)
IV	8(19.07%)
V	0(0%)

TABLE X

DILATATION OF THE BILE DUCT

Dilatation of the bile duct above stricture n (%)	
< 1.5 cm =1	20(48.78%)
1.5 to 3 cm =2	9(21.95%)
More than 3 cm =3	12(29.27%)

TABLE XI

HOSPITAL STAY

Hospital Stay (%)	
≤ 7 Days	0(0%)
8 to 14 Days	28(68.29%)
15 to 21 Days	11(26.83%)
22 to 28 Days	1(2.44%)
> 28 Days	1(2.44%)

TABLE XII:POST OPERATIVE COMPLICATIONS

Morbidity n (%)	
Restenoses	3(6.32%)
Bile Leakage	3(6.32%)
Cholangitis	2(4.44%)
Intestinal Obstruction	0(0%)
Wound Infection	11(22.32%)

TABLE XIII

FACTORS AFFECTING SURGICAL OUTCOME : UNIVARIATE ANALYSIS

Variables	P Value
Bilioma Drained	0.026*
Total Bilirubin	0.018*
Albumin	0.004*
Bismuth Classification Type 1	0.021*
Dilatation of Bile Duct more than 1.5cm	0.032*

TABLE XIV

FACTORS AFFECTING SURGICAL OUTCOME : MULTI1VARIATE ANALYSIS

Variable	Category	Odds ratio	95% CL	P Value
Interval between trauma and surgery (> 6 weeks)	≤ 6 weeks	0.472	0.243-0.918	0.027
Dilatation of the bile duct (ref : < 1.5)	> 1.5	10.18	1.09-94.73	0.042

TABLE XV
COMPARISON OF CLINICAL DATA BETWEEN EARLY (> 6 WEEKS) AND DELAYED (< 6 WEEKS) MANAGEMENT

Variable	Early Surgery (> 6 Wks)	Delayed Surgery (< 6 Wks)	P Value
No. Of Patients	35	6	-
SIGNS AND SYMPTOMS			
Pain	3	9	0.026
Jaundice	5	31	0.939
Cholangitis	0	18	0.396
Pruitis	11	3	0.857
Biloma Drained	3	15	0.026*
Calculous	0	5	0.289
CAUSE			
Laparoscopic Cholecystectomy	5	27	0.754
Lap Converted Open	1	9	0.651
LABORATORY FINDINGS			
Bilirubin	5.8	4.8	0.018
AST	57	70	0.339
ALT	42.8	60.95	0.685
Albumin	2.2	3.2	0.044
BISMUTH CLASSIFICATION			
CLASS I	1	5	0.021*
CLASS II	2	11	0.033
CLASS III	2	12	0.702
CLASS IV	1	7	0.542
CLASS V	0	0	0
DILATATION OF BILE DUCT			

A (< 1.5cm)	3	24	0.032
B (1.52 cm)	3	10	0.014
C (> 3cm)	0	1	0

SIGNIFICANT FACTORS AFFECTING OUTCOMES BY UNIVERIATE ANALYSIS

Bilioma Drained

Fig:5

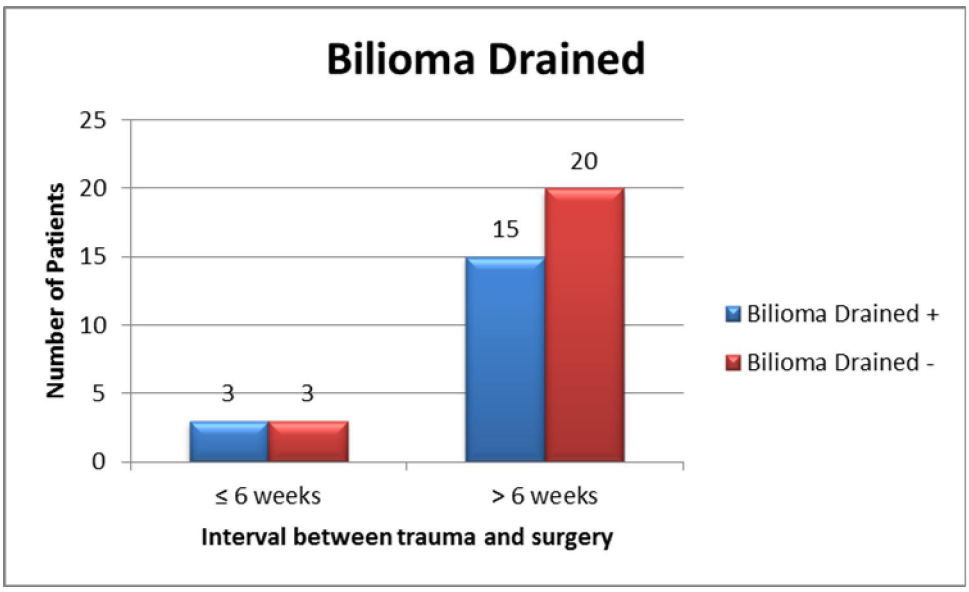


TABLE :XVI

Bilioma Drained	≤ 6 weeks	Percentage	> 6 weeks	Percentage
Bilioma Drained +	3	50.00	15	42.86
Bilioma Drained -	3	50.00	20	57.14
Total	6	100	35	100
P value	0.026*			

SIGNIFICANT FACTORS AFFECTING OUTCOMES BY UNIVERIATE ANALYSIS

Lab Findings

FIG:6

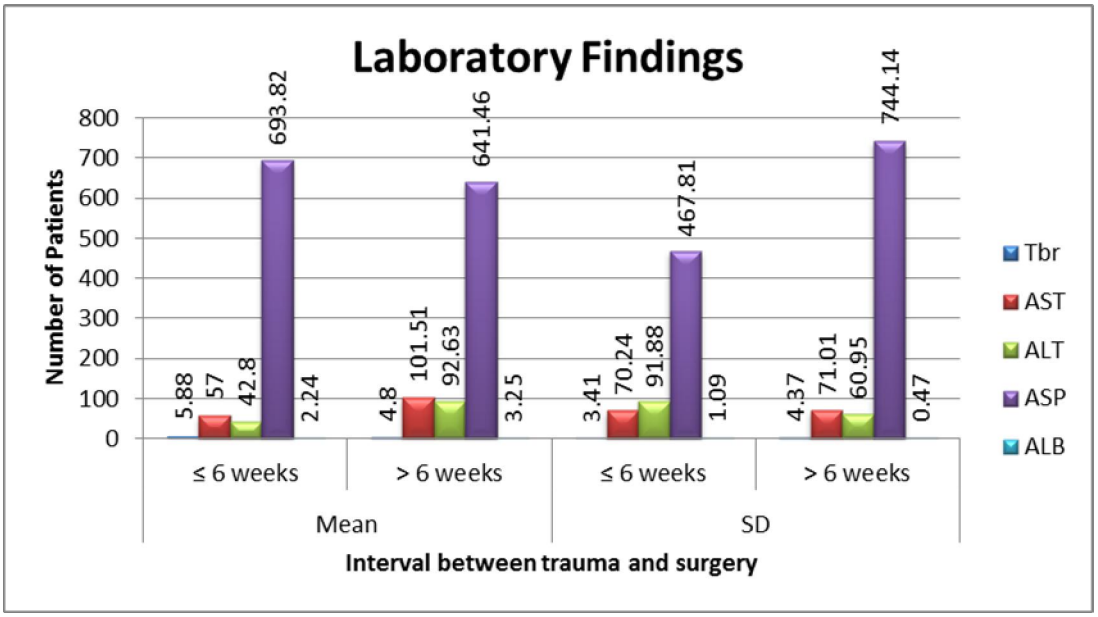


TABLE XVII

Laboratory Findings	Mean		SD		P value
	≤ 6 weeks	> 6 weeks	≤ 6 weeks	> 6 weeks	
Tbr	5.88	4.8	3.41	4.37	0.018*
AST	57	101.51	70.24	71.01	0.339
ALT	42.8	92.63	91.88	60.95	0.685
ASP	693.82	641.46	467.81	744.14	0.825
ALB	2.24	3.25	1.09	0.47	0.044*

SIGNIFICANT FACTORS AFFECTING OUTCOMES BY UNIVERIATE ANALYSIS

Dilatation of Bile Duct

FIG:7

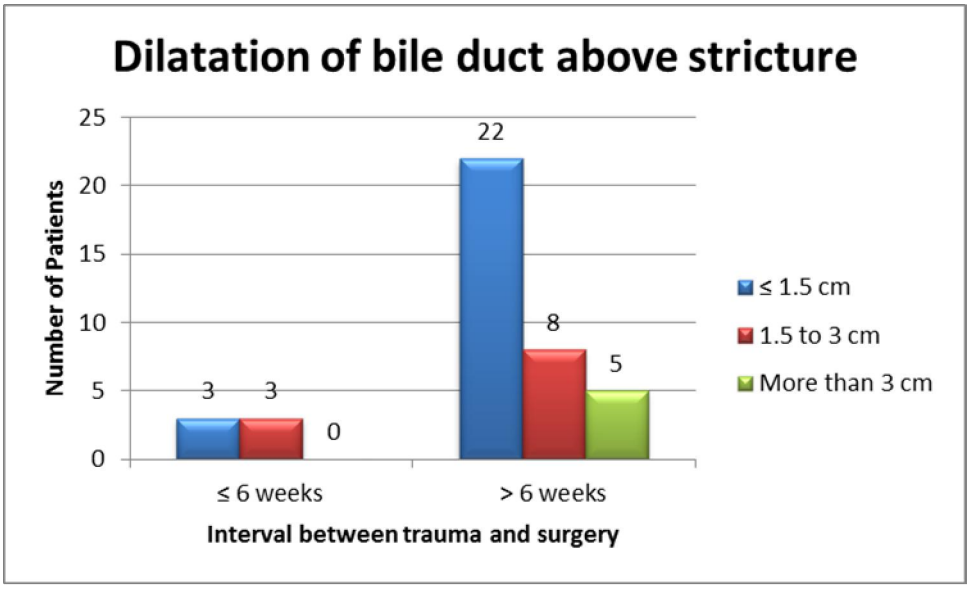


TABLE: XVIII

Dilatation of Bile Duct	≤ 6 weeks	Percentage	> 6 weeks	Percentage
≤ 1.5 cm	3	50.00	24	62.86
1.5 to 3 cm	3	50.00	10	22.86
More than 3 cm	0	0.00	1	3.29
Total	6	100.00	35	100.00
P value	0.032*			

SIGNIFICANT FACTORS AFFECTING OUTCOMES BY UNIVERIATE ANALYSIS

Bismuth Classification

FIG:8

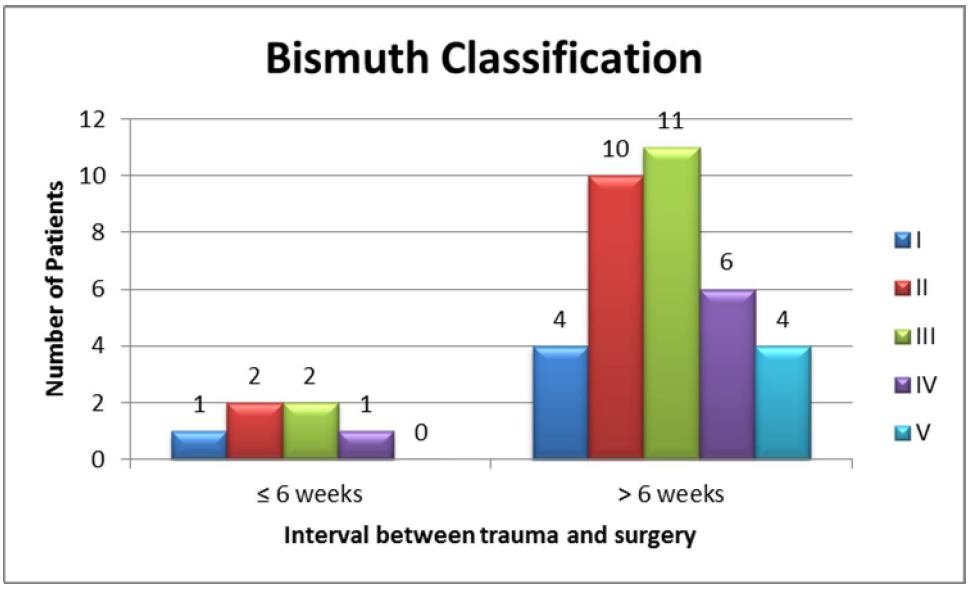


TABLE:XIX

Bismuth Classification	≤ 6 weeks	%	> 6 weeks	%
I	1	16.67	5	11.43
II	2	33.33	11	28.57
III	2	33.33	12	31.43
IV	1	16.67	7	17.14
V	0	0.00	0	0
Total	6	100	35	100
P value	0.021*			

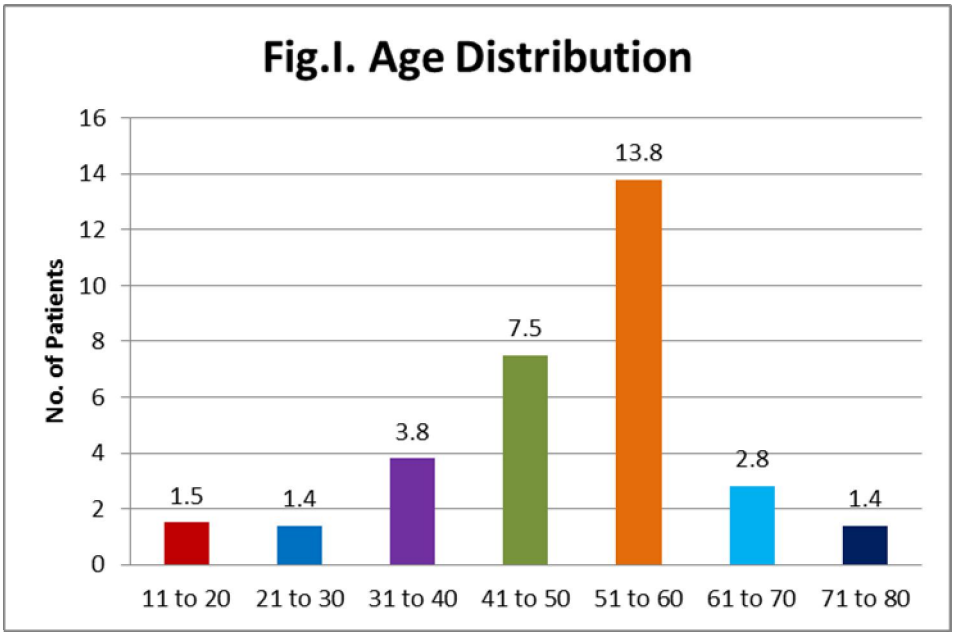


FIG: 2 GENDER DISTRIBUTION

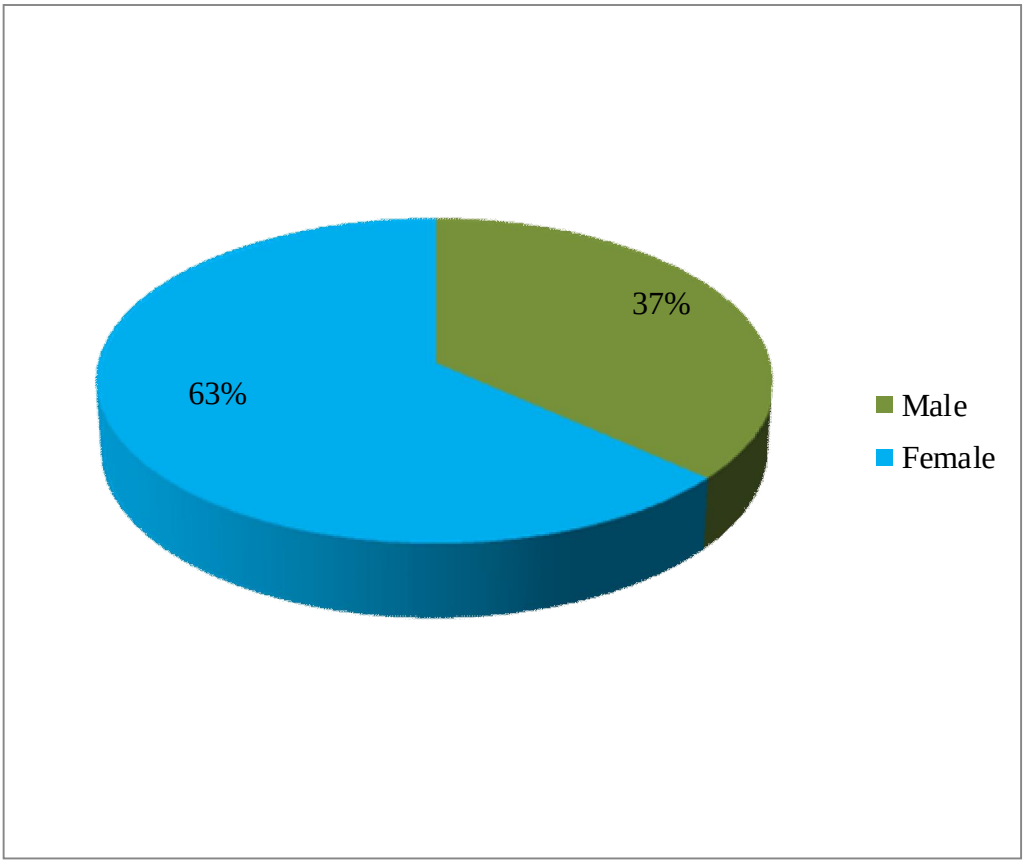


FIG. 3 : DISTRIBUTION OF BISMUTH CLASSIFICATION

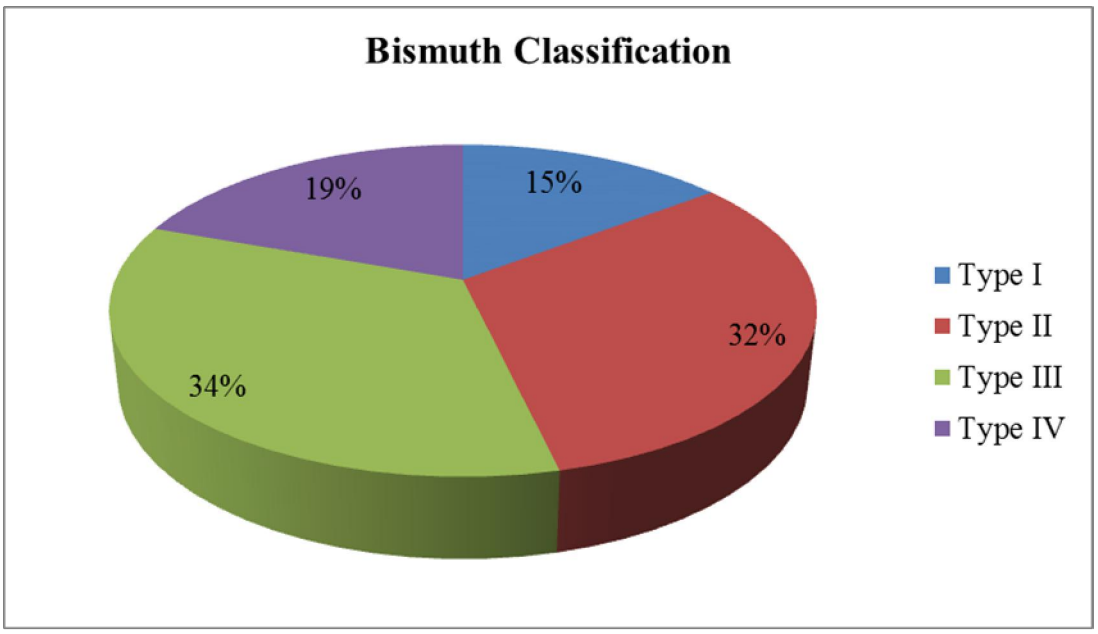


FIG. 4 : DISTRIBUTION OF BISMUTH CLASSIFICATION

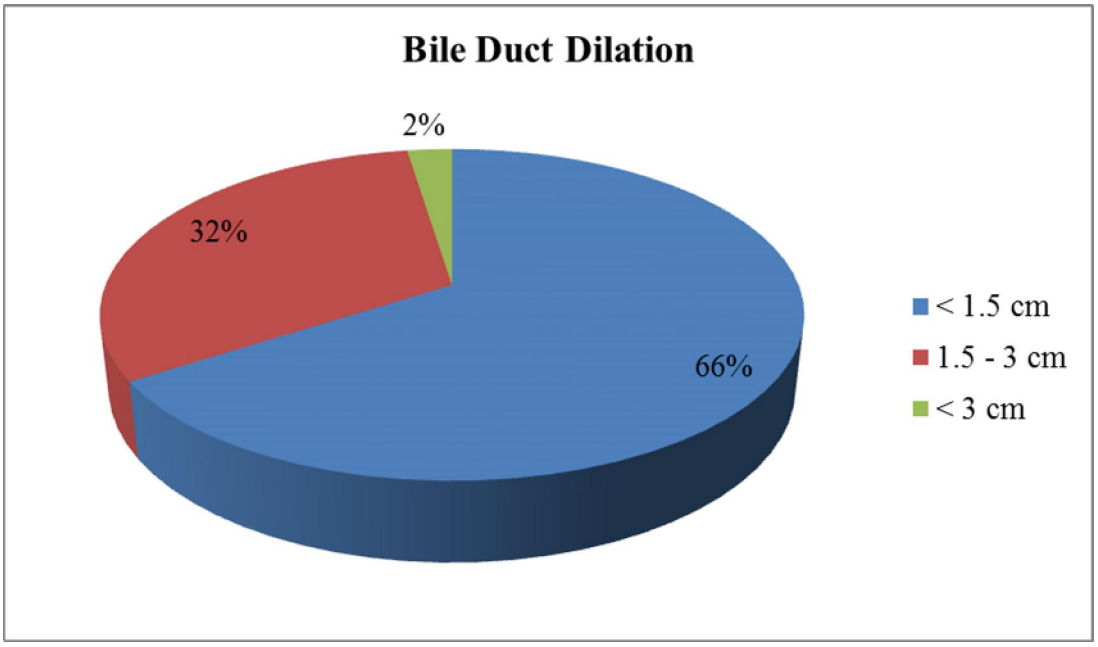


TABLE XX: COMPARISON OF OUTCOME WITH OTHER STUDIES

Authors Year	No. of Patients	Success Rate	Morbidity / Mortality	Follow – up (months)
Chapman et al 1995	104	76%	NR / 18%	86
Mc Donald, et al 1995	45	87%	36 / 0	55
Stewart & Way, et al 1995	45	94%	4% / 0	NR
Tocchi et al 1996	84	83%	21% / 2.2%	108
Lillemoe et al 1997	59	92%	NR / 0	33
Our Study	41	93%	23% / 0	12 - 67

FIG:9 MAGNETIC RESONANCE CHOLANGIOGRAPHY SHOWING BISMUTH TYPE IV BENIGN BILIARY STRICTURE

FIG :10 ADHERENT OF HEPATIC FLEXURE TO GB FOSSA

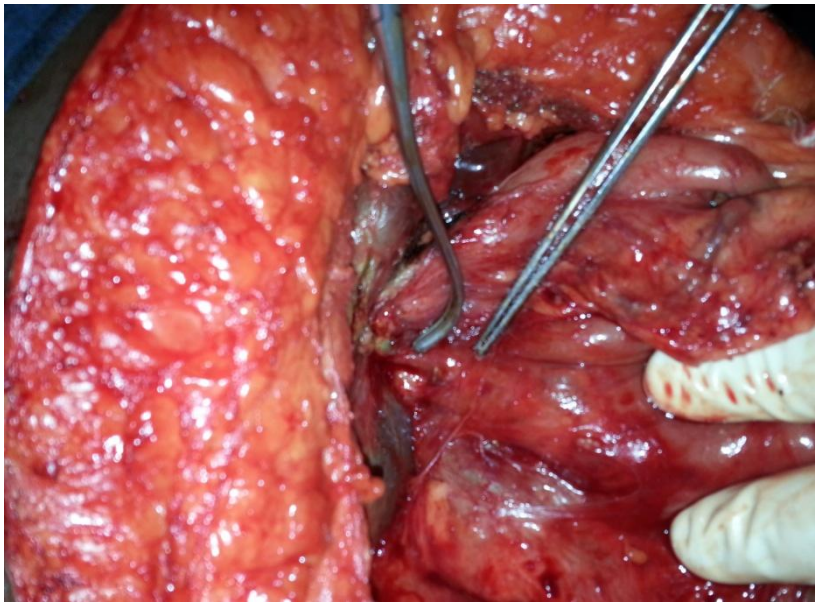


FIG: 11 HILAR PLATE BEING LOWERED AT THE BASE OF SEGMENT IV

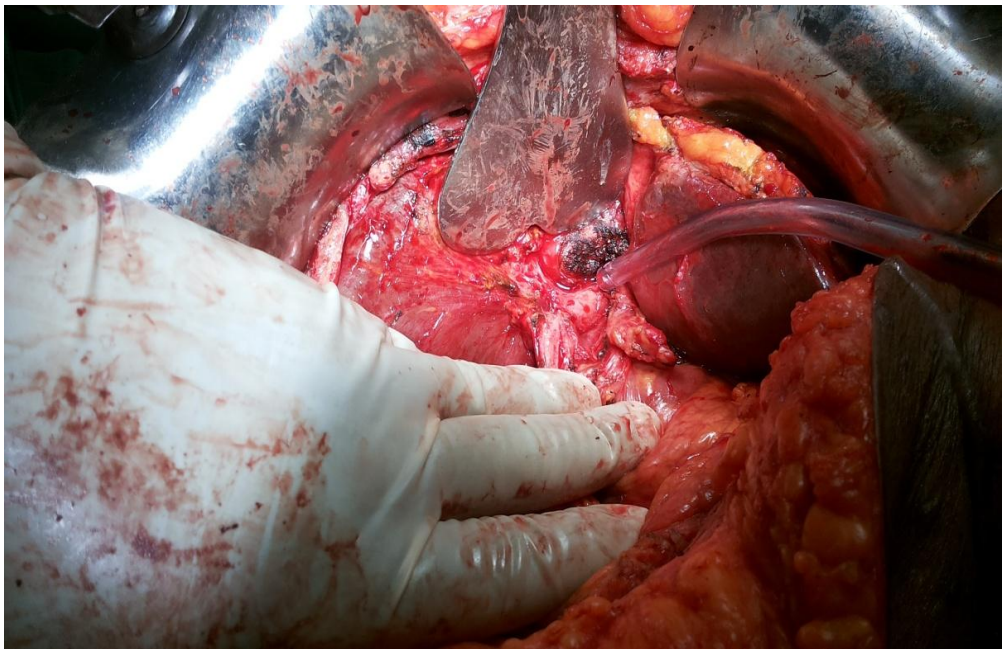


FIG:12 OPENED HEPATIC DUCT AT HILUM

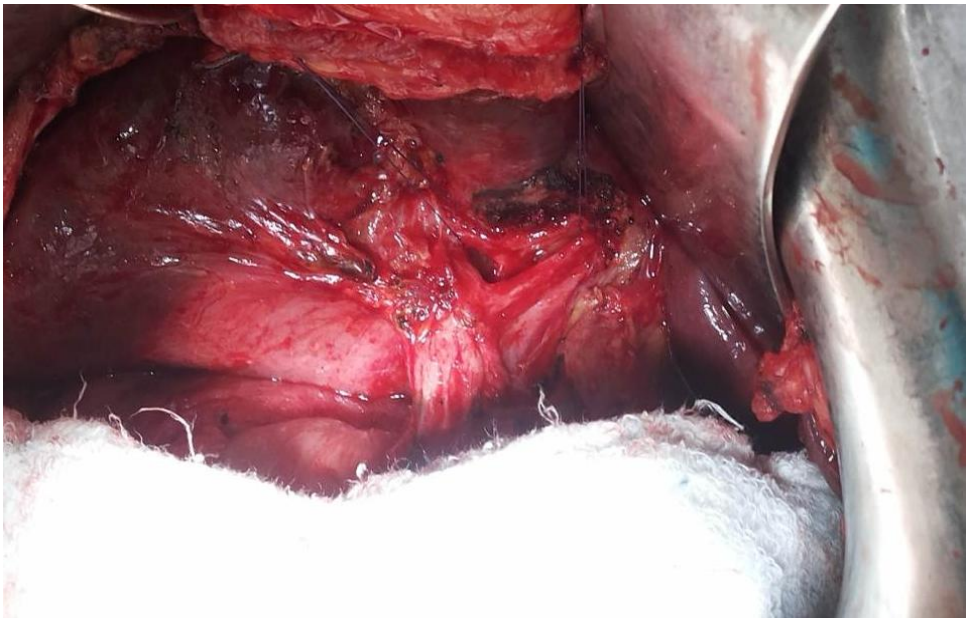


FIG:13 HEPATICOJEJUNOSTOMY IN PROGRESS

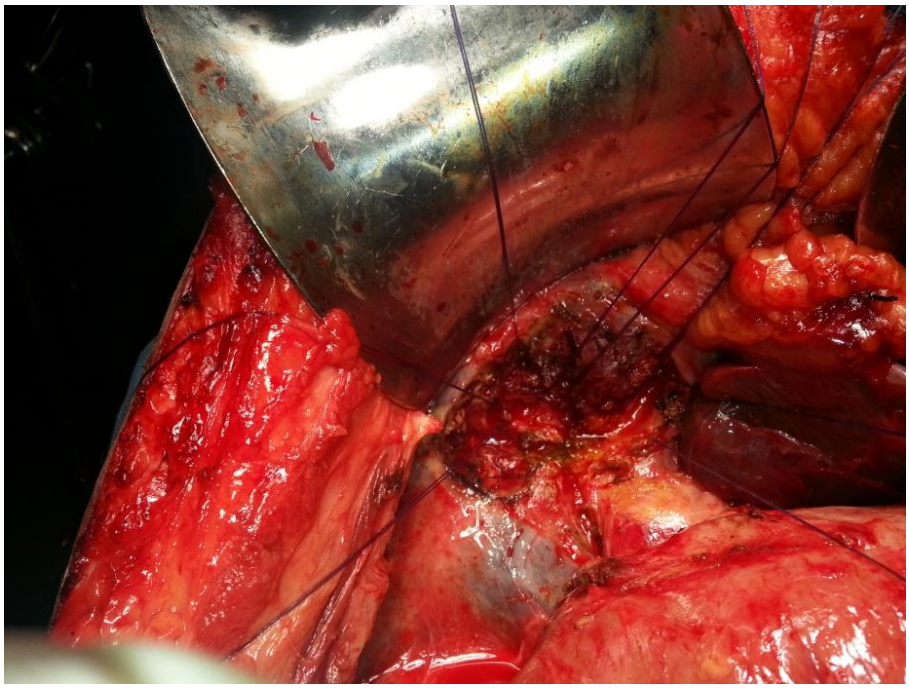
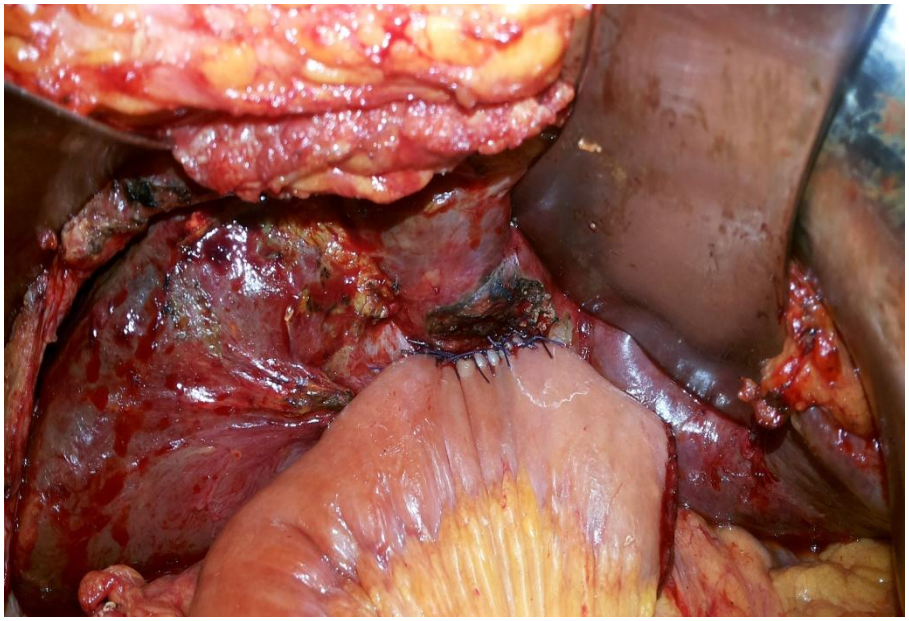


FIG:14 COMPLETED HEPATICOJEJUNOSTOMY



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INSTITUTIONAL ETHICAL COMMITTEE, STANLEY MEDICAL COLLEGE, CHENNAI-1

Title of the Work : Factors affecting surgical outcomes of post laparoscopic Cholecystectomy bile duct strictures

Principal Investigator : Dr.J. Saravanan

Designation : P.G. in M.ch (Surgical Gastroenterology)

Department : Department of Surgical Gastroenterology
Government Stanley Medical College,
Chennai-10

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 10.01.2014 at the Council Hall, Stanley Medical College, Chennai-1 at 2PM

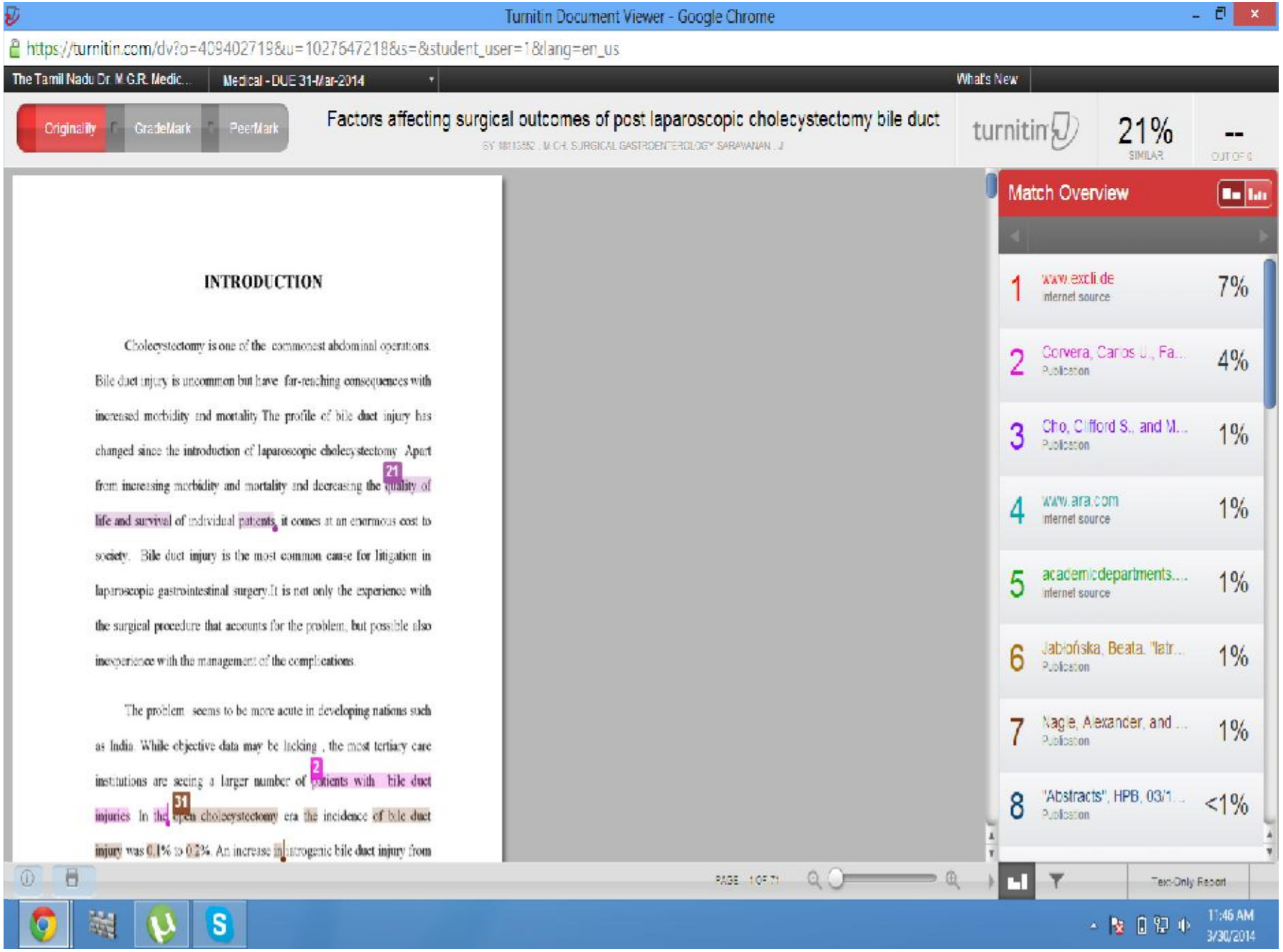
The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, site investigator investigation or guide or any other changes.
2. You should not deviate from the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s).
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.

21/3/14

MEMBER SECRETARY,
IEC, SMC, CHENNAI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Factors affecting surgical outcomes of post laparoscopic cholecystectomy bile duct
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INTRODUCTION
Cholecystectomy is one of the commonest abdominal operations. Bile duct injury is uncommon but have far-reaching consequences with increased morbidity and mortality. The profile of bile duct injury has changed since the introduction of laparoscopic cholecystectomy. Apart from increasing morbidity and mortality and decreasing the quality of life and survival of individual patients, it comes at an enormous cost to society. Bile duct injury is the most common cause for litigation in laparoscopic gastrointestinal surgery.It is not only the experience with the surgical procedure that accounts for the problem, but possible also inexperience with the management of the complications.
The problem seems to be more acute in developing nations such as India. While objective data may be lacking , the most tertiary care institutions are seeing a larger number of patients with bile duct injuries. In the open cholecystectomy era the incidence of bile duct injury was 0.1% to 0.2%. An increase in iatrogenic bile duct injury from
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ANNEXURE - I

PROFORMA

Demographic Profile :-

1. Name :
2. Age : /yrs
3. Sex : M / F
4. Occupation :
5. Income :
6. IP Number :
7. Date of Admission :
8. Date of Surgery :
9. Date of Discharge :
10. Length of Hospital Stay : Total- / days, Post op- /days

Clinical Details :-

1. **Symptoms** :
   Right hypochondriac pain / Malaise / Anorexia / Weight loss / Jaundice / Fever / UGI bleed / Miscellaneous – compressive symptoms / Duration of symptoms / Anorexia
2. Previous Jaundice / Blood Transfusion
3. Alcohol use / Smoking
4. Co-mobidities
5. Previous Surgery
6. Significant Family History

7. Clinical Examination details with per examination details – lymphadenopathy, Biloma.
8. Details of any pre-operative treatment – Open / Lap cholecystectomy
    - Biloma Drainage by Per-Cutaneous / Lap
    - Bilary operation history before this admission
9. Interval between trauma & referral.

Details of preoperative Investigations :-

1. Complete haemogram and basic urine analysis.
2. Blood sugar, renal function test with electrolytes.
3. Liver function test.
4. Viral markers status (HBs Ag and Anti - HCV).
5. Findings of Radiological imaging (CXR, USG with Doppler, CECT / MRI).
6. Dilatation of Bile Duct above Stricture.

Intraoperative Parameters :-

1. Type of Surgery :-Biloentoric anatomosis

Technique

Hepp – Couinaud

Blumgart – Kelly

Single / Double layer

Suture material

Type of Bismuth Classification

2. Associated Vascular injury
3. Other associated organ resection
4. Operative time
5. Blood loss
6. Blood transfusion – no of transfusions

Post op complications :-

1. Mortality
2. Haemorrhage
3. Cholangitis
4. Bile leak & bilioma
5. Wound complications
6. Pulmonary, cardiac and renal complications
7. Miscellaneous

Follow up details :-

1. Duration of Follow up – assessment of Symptoms / signs of restricture
2. LFT
3. Radiological imaging
4. Mortality – cause and duration after surgery.

நோயாளி சம்மத படிவம்

நுண்துளை அறுவைசிகிச்சை மூலம் பித்தப்பையை அகற்றியபிறகு வரும் பித்தக்குழாய் சுருக்கத்திற்கு மேற்கொள்ளப்படும் அறுவை சிகிச்சையின் முடிவுகளை நிர்மாணிக்கும் காரணிகள்

நோயாளியின் பெயர் .....

வயது ..... வருடங்கள் அல்லது பிறந்த தேதி .....

நோயாளியை தொடர்பு கொள்ளும் முகவரி .....

.....

.....

நோயாளியின் தொலைபேசி எண்.

நோயாளியின் இன்சியல்ஸ் ..... பாலினம் ஆண் ..... பெண் .....

		பங்கேற்பவரின் இன்சியல்/பெரு விரல் பதிப்பு
1)	மேல் குறிப்பிடப்பட்டுள்ள ஆய்வின் ..... தேதியிட்ட நோயாளிகளுக்கான செய்தி நான் படித்திருக்கிறேன் மற்றும் புரிந்திருக்கிறேன்/ விவரிக்கப்பட்டுள்ளேன். கேள்விகள் கேட்கவும் அனுமதி வழங்கப்பட்டுள்ளேன் என நான் உறுதி செய்கிறேன்.	
2)	இந்த ஆய்வில் பங்கேற்பது என் சொந்த விருப்பப்படியே என நான் புரிகிறேன். மேலும் என் மருத்துவ சிகிச்சை கவனிப்பு அல்லது சட்ட பூர்வ உரிமைகளுக்கு பாதிப்பு ஏற்படாமல் நான் எந்த நேரத்திலும் விலகிக் கொள்ளலாம் என்பதை புரிகிறேன்.	
3)	எத்திக்ஸ் கமிட்டி மற்றும் ரெகுலேட்டரி அதாரிட்டீஸ்க்கும் நான் இந்த ஆய்விலிருந்து விலகினாலும் தற்போதைய மற்றும் எதிர்கால இந்த ஆய்வு சார்ந்த என் உடல்நல குறிப்புகளை என் அனுமதியின்றி பார்க்க முடியும் என நான் அறிகிறேன்.	
4)	இந்த ஆய்வில் கிடைக்கப்பெறும் குறிப்புகள் மற்றும் முடிவுகளை உபயோகப்படுத்த தடை செய்ய மாட்டேன் என சம்மதிக்கிறேன். ஆனால் அவைகள் விஞ்ஞானம் சம்மந்தப்பட்டவைகளுக்கு மட்டும் பயன் உள்ளதாக இருக்க வேண்டும்.	
5)	மேற்கூறிய ஆய்வில் பங்கேற்க நான் சம்மதிக்கிறேன்.	

ஆய்வில் பங்கேற்பவர் / சட்டபூர்வமாக
ஏற்கப்பட்ட நபர் கையொப்பம் அல்லது
பெருவிரல் பதிவு

சுய ஒப்புதல் படிவம்

நுண்துளை அறுவைசிகிச்சை மூலம் பித்தப்பையை அகற்றியபிறகு வரும் பித்தக்குழாய் சுருக்கத்திற்கு மேற்கொள்ளப்படும் அறுவை சிகிச்சையின் முடிவுகளை நிர்மாணிக்கும் காரணிகள்

ஆராய்ச்சி நிலையம் : அரசு ஸ்டான்லி மருத்துவமனை
சென்னை - 600 001.

பங்கு பெறும் நோயாளியின் பெயர் : வயது :

பங்கு பெறும் நோயாளியின் எண் : பாலினம் : ஆண் ☐ பெண் ☐

நோயாளியின் விலாசம் :

நோயாளி இதனை (✓) குறிக்கவும்.

மேலே குறிப்பிடப்பட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது. என்னுடைய சந்தேகங்களை கேட்கவும். அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது. ☐

நான் என்னை இவ்வாய்வில் தன்னிச்சையாகதான் பங்கேற்க அனுமதிக்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் என்னை இவ்வாய்வில் இருந்து விலக்கி கொள்ளலாம் என்றும் அறிந்து கொண்டேன். ☐

இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். என்னை ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன். ☐

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும், பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான தகவல்களையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக் கொள்ளவும் அதை பிரசுரிக்கவும் என் முழு மனதுடன் சம்மதிக்கிறேன். ☐

இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக் கொள்கிறேன். எனக்கு கொடுக்கப்பட்ட அறிவுரைகளின்படி நடந்த கொள்வதுடன் இந்த ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்று உறுதியளிக்கிறேன். என் உடல் பாதிக்கப்பட்டாலோ அல்லது எதிர்பாராத வழக்கத்திற்கு மாறான நோய்க்குறி தென்பட்டாலோ உடனே அதை மருத்துவ அணிக்கு தெரிவிப்பேன் என உறுதி அளிக்கிறேன். ☐

இந்த ஆய்வில் எனக்கு இரத்தம், சிறுநீர், எக்ஸ்ரே, ஸ்கேன் உட்பட அனைத்து பரிசோதனைகளையும் செய்து கொள்ள நான் முழு மனதுடன் சம்மதிக்கிறேன் ☐

பங்கேற்பவரின் கையொப்பம் ..... இடம் ..... தேதி

கட்டைவிரல் ரேகை (இந்த படிவம் படித்து காட்டப்பட்டு புரிந்து கைரேகை அளிக்கின்றேன்)

பங்கேற்பவரின் பெயர் மற்றும் விலாசம் .....

ஆய்வாளரின் கையொப்பம் ..... இடம் ..... தேதி

ஆய்வாளரின் பெயர் .....

நோயாளி தகவல் தாள்

நுண்துளை அறுவைசிகிச்சை மூலம் பித்தப்பையை அகற்றியபிறகு வரும் பித்தக்குழாய் சுருக்கத்திற்கு மேற்கொள்ளப்படும் அறுவை சிகிச்சையின் முடிவுகளை நிர்மாணிக்கும் காரணிகள்

நோயாளிகளுக்கான தகவல்:
ஆராய்ச்சியின் நோக்கமும், ஆதாயங்களும்.

உங்கள் பங்கேற்பு திட்டமிடப்பட்டுள்ள இந்த மருத்துவ ஆராய்ச்சி ஆய்வின் நோக்கம் :

நுண்துளை அறுவை சிகிச்சை மூலம் பித்தப்பையை நீக்கிய பிறகு வரும் பித்தக்குழாய் சுருக்கம்தான், இன்றைய மருத்துவ உலகில் குடல்இரைப்பை மருத்துவர்கள் நீதிமன்றத்தில் அதிகமாக சந்திக்கும் வழக்காகும்.

இவ்வாறு அறுவைசிகிச்சைக்கு பின் ஏற்படும் பித்தக்குழாய் சுருக்கமானது, நுண்துளை பித்தப்பை அகற்றும் அறுவை சிகிச்சை முறை, எண்ணிக்கை உயர்ந்துள்ளதுக்கு இணையாக 0.1% - 0.2%ல் இருந்து 0.4% - 0.7% ஆக உயர்ந்துள்ளது. இதற்காக மேற்கொள்ளப்படும் அறுவை சிகிச்சையின், முடிவுகளை சில காரணிகள் தீர்மானிக்கின்றன. அவையாவன பித்தக்குழாய் சுருக்கம் எந்த இடத்தில் உள்ளது, சுருக்கத்திற்கு மேல் உள்ள பித்தக்குழாய் எவ்வளவு விரிவடைந்துள்ளது, பித்தக்குழாய் சுருக்கத்திற்கு எவ்விதமான அறுவை சிகிச்சை மேற்கொள்ளப்பட்டுள்ளது, எந்தவிதமான நூல் கொண்டு சுருக்கம் சரி செய்யப்பட்டது. அறுவை சிகிச்சைக்கு பிறகு பித்தநீர் மாற்றுவழியில் செல்ல ஏதாவது வழிமுறை செய்யப்பட்டதா, ஆம் என்றால் எவ்வளவு நாட்களுக்கு, மேலும் நோயாளிகள் தொடர்ந்து எவ்வளவு நாட்களுக்கு மறுபரிசோதனைக்கு வந்தார்கள் என்பதாகும்.

ஆராய்ச்சியின் நோக்கம் :

இந்த ஆராய்ச்சி கீழக்கண்ட நோக்கத்துடன் மேற்கொள்ளப்பட்டதாகும்.

1) பலதரப்பட்ட பித்தக்குழாய் சுருக்கத்திற்கு Biloenterostomy அறுவை சிகிச்சை செய்யும் போது அறுவைசிகிச்சை பின்விளைவுகளை எந்த காரணிகள் தீர்மானிக்கின்றன என்பதை மதிப்பீடு செய்தல்.

2) நுண்துளை மூலம் பித்தப்பை அகற்றிய அறுவை சிகிச்சைக்கு பிறகு மேற்கொள்ளப்படும் பித்தக்குழாய் சுருக்கத்திற்கான அறுவை சிகிச்சையை நோயாளியின் நோயின் தன்மை எவ்வாறு அறுவை சிகிச்சையின் முடிவுகளை மாற்றியமைக்கிறது என்பதனை மதிப்பீடு செய்தல்.

அந்தரங்கத்தன்மை

உங்கள் மருத்துவப் பதிவேடுகள் மிகவும் அந்தரங்கமாக வைத்துக் கொள்ளப்படும் மற்றும் மற்ற பிற மருத்துவர்கள் / விஞ்ஞானிகள் / இந்த ஆய்வின் தணிக்கையாளர்கள் அல்லது ஆராய்ச்சி ஆதரவாளர்களின் பிரதிநிதிகள் ஆகியோரிடமும் அவை வெளிப்படுத்தப்படும். இந்த ஆய்வின் முடிவுகள் அறிவியல் பத்திரிக்கைகளில் பிரசுரிக்கப்படலாம். ஆனால், பெயரை வெளியிடுவது மூலம் நீங்கள் அடையாளம் காட்டப்பட மாட்டீர்கள்.

ஆய்வில் பங்கேற்கும் நோயாளியின் கடமைப் பொறுப்புகள்

உங்களை கவனித்துக் கொள்ளும் மருத்துவருடன் நீங்கள் முழுமையாக ஒத்துழைக்க வேண்டும் என்று உங்களைக் கேட்டுக்கொள்றோம். சிகிச்சையளிக்கும் மருத்துவர் அளிக்கும் அறிவுரைகளை பின்பற்ற வேண்டும் என்றும், என்னென்ன செய்ய வேண்டும், என்னென்ன செய்யக்கூடாது என்று உங்களிடம் கூறப்பட்டுள்ளவற்றிலிருந்து சற்றும் விலகக்கூடாது என்றும் நீங்கள் எதிர் பார்க்கப்படுகிறீர்கள்.

ஆய்வில் உங்கள் பங்கேற்பு மற்றும் உங்கள் உரிமைகள்

இந்த ஆய்வில் உங்கள் பங்கேற்பு தன்னிச்சையானது மற்றும் காரணங்கள் எதையும் கூறாமலேயே நீங்கள் இந்த ஆய்விலிருந்து எந்த ஒரு நேரத்திலும் விலகிக் கொள்ளலாம். எப்படியிருந்தாலும், உங்கள் உடல் நிலைக்கேற்ப உங்களுக்கு பொருத்தமான சிகிச்சை அளிக்கப்படும். ஆய்வில் பங்கேற்க நீங்கள் மறுப்பதால், அடுத்து வரும் ஆராய்ச்சி ஆய்வுகளில் உங்கள் பங்கேற்பை மறுப்பது போன்ற எந்தவித அபராதமும் விதிக்கப்படாது. உங்களை கவனித்துக் கொள்ளும் மருத்துவருடன் முழுமையாக ஒத்துழைக்க நீங்கள் சம்மதிக்க வேண்டும். எந்த ஒரு நேரத்திலும், நீங்கள் மோசமாக உணர்ந்தாலோ அல்லது வேறு ஏதேனும் உடல் நலக்குறைவு உண்டானாலோ, தயவு செய்து, உங்களை கவனித்து வரும் மருத்துவரிடம் உடனடியாக தெரிவிக்கவும், சிகிச்சை உங்களுக்குப் பொருத்தமாக இருக்காது என்று தோன்றினால் உடனடியாக நிறுத்தப்படும். உங்கள் சம்மதம் இன்றியே கூட ஆய்வு நிறுத்தப்படுவது சாத்தியமே, ஆய்வின் பொழுது ஏதேனும் புதிய தகவல் தெரிய வந்தால், அதைப்பற்றி உங்கள் மருத்துவர் உங்களுக்கு தெரிவிப்பார்.

வேறு ஏதேனும் கேள்விகள் / பிரச்சனைகள் பற்றி நீங்கள் கேட்க விரும்பினால், கீழ்க்கண்ட நபரைத் தொடர்பு கொள்ளவும்.

தனியாகப் பிரிதெடுத்து, ஆய்வில் பங்கேற்பவரிடம் தரப்பட வேண்டும்.

ஆய்வில் பங்கேற்பவர் / சட்டபூர்வமாக
ஏற்கப்பட்ட நபர் கையொப்பம் அல்லது
பெருவிரல் பதிவு

Name	Age	Gender	SIGNS AND SYMPTOMS							Biliary operation	Type of Operation	Interval between trauma	Laborotory Findings - LFT					Bismuth Classification	Dilatation of the bile duct	HOSPITAL STAY	MORTALITY	calculous	stenosis	cholangitis	Abdominal Abscess	wound inf
			pain	jaundice	cholangitis	pruitius	stone	biliary fistula	bilioma				Tbr	AST	ALT	ASP	ALB									
Arulselvi	35	2	0	1	0	1	0	1	0	1	1	30	10	49	21	422	3.1	3	2	10	0	0	0	0	0	0
Alamelu	28	2	0	0	1	0	0	0	1	2	1	126	1.2	114	129	915	4	4	1	18	0	0	1	1	0	1
Zareena	38	2	0	0	1	0	0	0	1	1	1	26	4	100	111	476	3.2	2	2	10	0	0	0	0	0	0
Ganapathy	64	1	0	0	1	0	0	0	0	1	2	22	2	86	90	332	3.1	2	3	12	0	0	0	0	0	0
Chinaponnu	45	2	0	1	1	0	0	0	1	1	2	52	3	97	96	347	3	4	1	10	0	0	0	0	0	0
Rathidevi	48	2	0	1	0	0	0	0	1	1	1	364	1.7	12	10	285	3.8	1	2	10	0	0	0	0	0	0
Jayanthi	32	2	0	1	1	0	0	1	0	1	1	39	3.4	95	57	372	3.4	3	1	9	0	0	0	0	0	0
Bhoopathy	40	1	0	1	1	0	0	1	0	1	1	30	5.4	89	86	452	3.2	2	1	11	0	0	0	0	0	0
Komala	49	2	0	1	1	0	1	0	1	1	1	152	1.3	49	51	181	4.2	2	2	10	0	0	0	0	1	0
Krishnaveni	35	2	0	1	1	0	0	1	1	1	1	60	2.1	97	76	673	3.8	2	1	10	0	0	0	0	0	1
Lakshmi	58	2	0	1	0	0	0	1	0	1	1	17	0.7	110	25	19	3.2	3	2	12	0	1	1	1	0	0
Mahalakshmi	40	2	0	1	0	0	0	1	0	1	2	78	17	130	80	2961	1.9	3	1	10	0	0	0	0	0	0
Patachi	45	2	0	1	0	1	0	1	1	2	2	130	1	95	75	525	3.6	1	2	10	0	0	0	0	0	1
Ravi	40	1	0	1	0	0	0	0	0	1	2	21	3.9	93	100	677	3.1	2	1	16	0	0	0	0	0	0
Ravi	42	1	0	1	0	0	0	0	1	1	1	4	3	45	42	645	3	4	3	12	0	0	1	0	0	1
Sekar	42	1	0	1	1	0	0	1	0	1	1	34	5	67	89	457	3	4	1	11	0	0	0	0	0	0
Senthil Kumar	33	1	0	1	0	0	0	0	1	1	1	26	3	224	234	690	3	1	1	13	0	0	0	0	0	0
Shantha	45	2	1	1	0	0	0	0	1	1	2	34	4.9	217	244	266	3.1	3	1	11	0	0	0	0	0	1
Sivasakthi	26	2	1	1	0	1	0	0	1	1	2	2	1	222	266	225	3.2	1	1	8	0	1	0	0	0	0
Suriyakala	37	2	1	1	1	0	0	0	0	1	1	104	3	123	234	345	3.1	2	1	14	0	0	0	0	0	0
Thenmozhi	46	2	1	1	1	1	0	0	0	1	2	52	9	121	211	478	3.2	2	1	12	0	0	0	0	0	1
Vadivel	25	1	1	0	1	0	0	0	0	1	1	26	6	80	92	416	3.1	2	2	10	0	0	0	0	0	0
Valliammal	42	2	0	1	0	1	0	0	0	1	2	17	5	146	90	429	3.3	4	3	15	0	0	0	0	0	0
Verrammal	40	2	0	1	0	0	0	0	1	1	1	21	10	128	121	1670	3	4	1	16	0	1	0	0	1	0
Yamunabai	56	2	0	1	0	0	0	0	0	1	1	8	16	289	172	1584	3.1	2	1	12	0	0	0	0	0	0
Venkamesh	25	1	0	1	0	0	0	0	0	1	1	8	4.7	10	9	80	3.1	4	3	18	0	0	0	0	0	1
Madhavan	46	1	0	1	0	0	1	0	1	1	1	43	15	334	56	890	3.2	5	1	11	0	0	0	0	0	0
Pethang	45	2	0	1	1	1	0	0	0	1	1	8	0.4	32	24	158	3.1	3	1	26	0	1	0	0	0	0
Bazilath	28	2	0	1	1	0	0	0	0	1	1	52	2	34	56	180	3	5	3	15	0	0	0	0	0	0
Chandrabose	57	1	0	1	0	0	1	0	0	1	1	96	4	56	78	478	2.4	5	1	14	0	0	0	0	0	1
Geetha	51	2	1	1	0	1	0	1	1	2	1	4	5	45	44	470	3	3	3	20	0	0	0	0	0	1
Ibhrahim	27	1	1	1	0	1	0	0	0	1	1	5	3	34	23	450	3.2	2	1	13	0	1	0	0	0	0
Indirani	50	2	0	1	0	0	0	0	1	1	1	34	1.2	61	76	344	3.3	3	1	39	0	0	0	0	0	0
Viinnarasi	19	2	1	1	1	1	1	0	1	1	1	52	1.2	116	84	354	3.6	1	1	16	0	0	0	0	0	0
Venkatachalapathy	67	1	1	1	1	0	0	0	1	1	1	17	1.4	55	88	388	3.5	3	1	11	0	0	0	0	0	0
Usharani	35	2	1	1	1	1	1	0	1	1	1	312	3.4	64	51	3567	3	3	1	19	0	0	0	0	0	0
Selvaraj	55	1	0	1	0	1	0	0	0	1	1	226	2	30	44	238	4.6	3	2	10	0	0	0	0	0	0
Sagadurna	29	2	1	1	1	1	0	0	0	1	1	34	4	45	67	456	3	5	1	14	0	0	0	0	0	0
Muthukrishnan	43	1	1	1	0	0	0	0	0	1	1	26	10	105	115	346	3.4	3	3	8	0	0	0	0	0	0
Jothimani	32	2	0	1	0	1	0	0	0	1	1	5	8	86	60	1510	1	2	1	16	0	0	0	0	0	0
Gnanasekar	53	1	0	0	0	1	0	0	0	1	1	6	10	75	45	1010	1	3	1	19	0	0	0	0	0	0

Gender 1 Male 2 Female

Jaundice 0 No Jaundice 1 Present

Pruitius 0 No 1 Present

Bilioma 0 Not drained 1 Drained

Type of Operation 1 Lap. 2 Lap converted Open

Abdominal Abscess 0 Absent 1 Present

Pain 0 No Pain 1 Present

Cholangitis 0 No 1 Present

Stone 0 No 1 Present

Biliary Fistula 0 No 1 Present

Stenosis 0 Absent 1 Present

Wound Infection 0 Absent 1 Present